A·I·B·S

bulletin

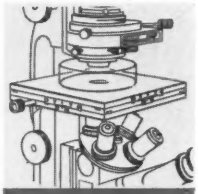
NEWS AND VIEWS IN THE BIOLOGICAL SCIENCES

Vol. VIII JUNE 1958 No. 3

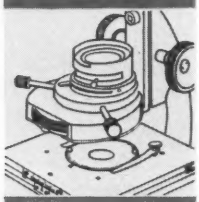
published by

THE AMERICAN INSTITUTE OF BIOLOGICAL SCIENCES

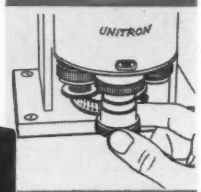
In a PHASE-CAMERA-MICROSCOPE Only UNITRON offers all three:



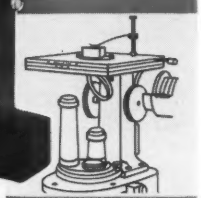
Graduated Mechanical Stage



Focusable Turret Condenser



Photographic Eyepiece Turret



Macro Accessories

- ✓ CONVENIENCE
- ✓ VERSATILITY
- ✓ ECONOMY

UNITRON'S unique Phase-Camera-Microscope will assure you a **CONVENIENCE** of operation impossible to duplicate with a conventional microscope stand. For example, a specimen consisting of a tissue culture or aqueous solution may be examined in the very petri dish in which it has been prepared. Merely place the dish on the microscope stage; examine the contents visually, project the image on the viewing screen, or photograph — all in rapid sequence and at magnifications up to 2000X. With the inverted design, there is no need to contend with slipping cover glasses or evaporating fluids. Using the phase optics, you dispense with messy chemical staining. Aided by the self-contained illumination system and built-in cameras, you eliminate troublesome problems of alignment and vibration.

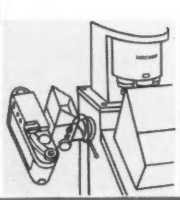
UNITRON'S Phase-Camera-Microscope, optically equipped for Bright and Dark Phase Contrast, bright and dark field, and polarized light, offers the microscopist a working tool of unmatched **VERSATILITY.** The overhead turret phase condenser is centerable, divisible, and provides long working distances sufficient even for micro-manipulation. Provision is included for *four* different cameras — 3¼" x 4¼", 35mm., Polaroid, and motion picture. Available at extra cost are macro accessories for magnifications as low as 5X and accessories for opaque specimens. This UNITRON model meets not only your urgent needs of today — its versatility is your assurance of continued usefulness in the future.

UNITRON'S Phase-Camera-Microscope is the ideal all-purpose instrument for visual examination, viewing, and photo-recording. Completely equipped with an impressive array of optics, its cost is actually lower than that of a conventional phase stand, camera and illuminator — true **ECONOMY** for any laboratory.

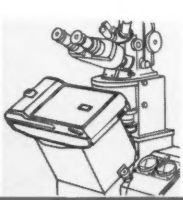
8 Phase Contrast Objectives

Visual Eyepieces | 4 Photographic Eyepieces, Filters.

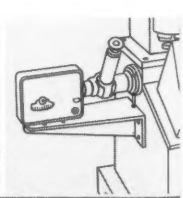
Standard 3¼" x 4¼" Camera



Accessory 35mm. Camera



Accessory 3¼" x 4¼" Polaroid Land Camera



Accessory Motion Picture Camera

UNITRON'S Phase-Camera-Microscope Model BU-13 as described including binocular body; 8 phase objectives 10X, 20X, 40X, 100X oil, in both bright and dark contrast; paired visual eyepieces R5X, P10X, Ke15X; focusing telescope; four photographic eyepieces 10X, 15X, 20X, Micrometer; phase condenser; filters; polarizing accessories; special glassware, etc.

Monocular Model U-13

$1580
FOB Boston
$1390

UNITRON
INSTRUMENT DIVISION OF UNITED SCIENTIFIC CO.
204-206 MILK STREET • BOSTON 9, MASSACHUSETTS

Please rush UNITRON's Microscope Catalog 18F

Name_____
Company_____
Address_____
City_____ State_____

THE TREND IS TO UNITRON

A.I.B.S. BULLETIN

Published by the American Institute of Biological Sciences

2000 P Street, N. W., Washington 6, D. C.

•

Vol. VIII **JUNE 1958** **No. 3**

A.I.B.S. OFFICERS
W. O. FENN, President
PAUL KRAMER, Vice-President
F. P. CULLINAN, Secretary-Treasurer

EXECUTIVE DIRECTOR
HIDEN T. COX

EDITORIAL BOARD
RONALD BAMFORD, Chairman
T. C. BYERLY
RALPH E. CLELAND
EDMOND J. FARRIS
BOYD HARSHBARGER
LOUIS LEVIN
H. BURR STEINBACH

EDITOR
ILEEN E. STEWART

MEMBER SOCIETIES
American Bryological Society
American Physiological Society
American Phytopathological Society
American Society for Horticultural Science
American Society of Human Genetics
American Society of Ichthyologists and Herpetologists
American Society of Naturalists
American Society of Parasitologists
American Society of Plant Physiologists
American Society of Plant Taxonomists
American Society of Zoologists
Botanical Society of America
Conference of Biological Editors
Ecological Society of America
Genetics Society of America
Mycological Society of America
National Association of Biology Teachers
Poultry Science Association
Society for Industrial Microbiology
Society of General Physiologists
Society for the Study of Development and Growth

AFFILIATE SOCIETIES
American Association of Anatomists
American Dairy Science Association
American Genetic Association
American Ornithologists' Union
American Society of Animal Production
American Society of Limnology and Oceanography
American Society of Mammalogists
Association of Southeastern Biologists
Biological Photographic Association
International Association of Dental Research
National Pest Control Association
Potato Association of America
Society of American Bacteriologists
Society of American Foresters
Society of Experimental Medicine
Society of Protozoologists
Society for the Study of Evolution
Society of Systematic Zoology

ASSOCIATES
Abbott Laboratories
The American Tobacco Company
Associated Seed Growers, Inc.
Baxter Laboratories, Inc.
Difco Laboratories
General Biological Supply House
Hercules Powder Company
Hoffmann-La Roche, Inc.
Lilly Research Laboratories
Monsanto Chemical Company
Charles Pfizer & Company, Inc.
Schering Corporation
Squibb Institute for Medical Research
Ivan Sorvall
Upjohn Company
Ward's Natural Science Establishment

CONTENTS

Education for Tomorrow ..... *Hiden T. Cox* 9

Antarctic Microbiology ..... *John M. Sieburth* 10

Is Biology Obsolete? ..... *Walter P. Taylor* 12

The Biologist as Industrial Consultant ..... *Philip S. Thayer* 15

Conference on Shark Repellents ..... *Lester R. Aronson* and *Perry A. Gilbert* 17

Naturalists, Campers, and Related Small Fry—Welcome to Old Indiana ..... *Frank N. Young* 19

Nature Preserves Recently Established by the Nature Conservancy ..... *Richard H. Goodwin* 20

Across the Editor's Desk 22

From the Societies 26

Education and Manpower 27

AIBS Reports 28

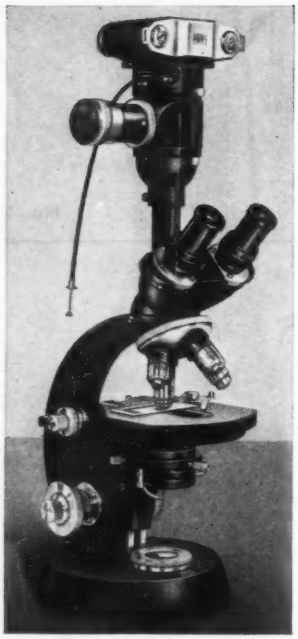
Biology Library 29

Advanced Registration for Indiana Meeting 31

* * *

COVER. Ringed Penguin Rookery at Half-moon Island, South Shetlands, with Argentine Naval base at Teniente Camara in background.
Photo by John M. Sieburth.

The A.I.B.S. Bulletin is published 5 times a year in January, April, June, August, and November. Copyright 1958 by the American Institute of Biological Sciences, 2000 P Street, N. W., Washington, D. C. Subscription prices: $2.00 a year (50 cents a copy; August program issue $1.00) and to affiliate members, $1.00 a year; Canada, South America & Central America, $2.50; all other foreign, $3.00. Address all communications to the Editor, American Institute of Biological Sciences, 2000 P Street, N. W., Washington, D. C. Entered as second class matter at the Post Office, Washington, D. C. Printing and typography: Judd & Detweiler, Inc., Washington, D. C. Advertising rates and information mailed on request.



Made in West Germany

CARL ZEISS

STANDARD MICROSCOPE

GFL-654-633

Carl Zeiss Standard Microscopes are products of nearly a century of experience in design and construction. They are offered in a wide variety of models to suit every purpose, one of which is the GFL-654-633.

It features a special tube and Attachment Camera designed to make photomicrography positive, simple and fast. Its accomplishments in bright and dark field, phase contrast, micro-projection and photomicrography are renowned.

Optically and mechanically it is without a peer. The Attachment Camera produces standard 35mm pictures, although various adapters for larger sizes may be interchanged. A reflex prism attachment ring and focusing eyepiece assure ease, speed and accuracy.

Write for free detailed literature

GUARANTEED UNINTERRUPTED REPAIR SERVICE

CARL ZEISS, INC.

485 FIFTH AVENUE, NEW YORK 17, N. Y.

INSECTS AND MITES OF WESTERN NORTH AMERICA, Revised Edition

By EDWARD O. ESSIG, *Professor Emeritus of Entomology, University of California at Berkeley*

This general manual of western insects now includes 59 new illustrations and 100 additional species, bringing the book's coverage to 2617 genera and 6317 species. New developments in insect control and insecticides are discussed and illustrated. *Published Spring 1958*

THE NUMBERS OF MAN AND ANIMALS

Edited by J. B. CRAGG *and* N. W. PIRIE

This book is a record of a symposium held at the Institute of Biology (England) pointing up both the common ground and the serious gaps that exist in our knowledge of the numbers of man and animals. *1957, 152 pages, $2.75*

THE STRATEGY OF THE GENES: A Discussion of Some Aspects of Theoretical Biology

By C. H. WADDINGTON, *University of Edinburgh*

A noted authority discusses (1) the nature of the organization of biological processes which results in living things having definite and characteristic structures; and (2) how evolution brings into existence organisms so well adapted to the requirements of life that they appear as if guided toward some end. *1958, 262 pages, $4.00*

PRINCIPLES OF HORTICULTURE

By ERVIN L. DENISEN, *Iowa State College*

This strikingly-illustrated text emphasizes those aspects of horticulture which are of general cultural interest. The author relates the principles of horticulture to the home grounds and includes an interesting chapter on hobbies.

Published late Spring 1958

The Macmillan Company

60 FIFTH AVENUE, NEW YORK 11, N. Y.

Make Your Science Courses More Dynamic With These New Interestingly-Written Mosby Texts

Russell

AN INTRODUCTION TO THE PLANT KINGDOM

One of the few texts designed for a one semester "Introductory Botany" course utilizing the "plant kingdom" approach, AN INTRODUCTION TO THE PLANT KINGDOM may also be used very adequately as a one semester intermediary course on the "Plant Kingdom." Simply written, it is nonetheless highly scientific and completely up-to-date. Discussing representative species in detail, this easy-to-understand work emphasizes morphology, phylogeny and ecology of the major plant groups. General and specific characteristic features of the major taxa are covered with stress on their relative evolutionary positions along with discussions of morphology, life history and physiology of higher plants. To help you clarify major plant groups, the "type" method of illustration is used throughout with illustrations nearly all original.

By NORMAN H. RUSSELL, Ph.D., Professor of Biology, Grinnell College, Grinnell, Iowa. Just Published. 353 pages, 6½"x9½", 184 illustrations. Price, $5.50.

New 5th Edition

Beaver

GENERAL BIOLOGY, THE SCIENCE OF BIOLOGY

Written for one year beginning college courses in "General Biology," the new, 5th edition of GENERAL BIOLOGY, THE SCIENCE OF BIOLOGY, is an up-to-date and complete, but not exhaustive, scientific treatment of the more important phenomena in both plants and animals. While not written as a text in human anatomy and physiology, this text emphasizes human biology when and where it will be beneficial. Divided into six parts and numerous chapters—thus permitting you to select and emphasize text matter to suit your needs, this book guides your students through the various biologic phenomena. Many new illustrations and tables supplement and reinforce the text matter.

By W. C. BEAVER, A.B., M.Sc., Ph.D., Sc.D., Head of the Department of Biology, Wittenberg College, Springfield, Ohio. Just Published. 5th edition, 775 pages, 6½"x9½", 445 illustrations, 1 color plate. Price, $6.75.

New 5th Edition

Beaver

WORKBOOK AND LAB MANUAL IN GENERAL BIOLOGY

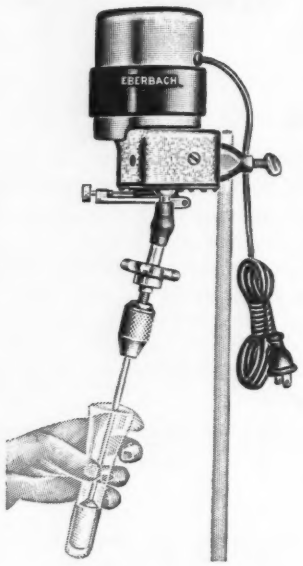
Formerly Beaver's "Biologic Science in Laboratory and Field" to accompany Beaver's textbook on biology described above. Just published. 5th edition, 234 pages, 7¾"x10½", 11 illustrations. About, $3.75.

Gladly Sent to Teachers of College Level Courses
For Consideration As Texts

The C. V. MOSBY Company

3207 Washington Boulevard, St. Louis 3, Missouri

Eberbach



CON-TORQUE POWER UNIT FOR TISSUE HOMOGENIZATION

- For Culture Work . . . Pathological and Biological Studies
- Constant Torque Provides Continuous Positive Grinding Action

Now you can homogenize tissue effortlessly for culture work as well as pathological and biological study. Eberbach's new variable-speed Con-Torque gives constant full torque at all speeds and eliminates possibility of tissue jamming the pestle in grinding vessel. Speeds from 0 to 350 r.p.m. are selected by means of a lever which is locked at a setting by a thumb screw. Unit may also be utilized for stirring jobs; a fixed ⅜" coupling is included as an accessory.

No. 28-335 115 volt, 60 cycle A.C. $160.00

Write for Bulletin No. 545B

Eberbach
CORPORATION

P.O. Box 63 Ann Arbor, Michigan

NEW BOOKS . . . NEW EDITIONS *from* Van Nostrand

THE FOUNDATIONS OF LIFE SCIENCE
By Mark Graubard, *Professor of Natural Science, University of Minnesota*
Planned specifically for survey courses in biological science, this new text presents a unique and meaningful approach. It stresses the basic concepts which encompass all of biology, thereby making unnecessary the usual division into zoology and botany. For example, reproduction and pollination; nutrition and metabolism; respiration and transpiration—each pair is treated as one unit. Extensively pre-tested to assure suitability for non-science students. *627 pages, $6.50*

ZOOLOGY, Second Edition
By A. M. Winchester, *Head of Biology Department, Stetson University* and Harvey B. Lovell, *Professor of Biology, University of Louisville*
This excellent presentation places particular emphasis on those phases of zoology which relate closely to man and his everyday life. Enriched with bold line drawings and hundreds of new photographs, this text is a real boon for teachers, as evidenced by the lively narrative and helpful teaching aids. *582 pages, $6.25*

BIOLOGY AND ITS RELATION TO MANKIND, Second Edition
By A. M. Winchester, *Head of Biology Department, Stetson University*
A painstaking revision, not only to guarantee representation of the most recent discoveries, but to insure proper introduction to the entire field of biology. The text directs attention to the many aspects of biology, rather than reporting minor technical points which discourage beginning students. The extraordinary illustrations, together with a stimulating narrative, help the student reach a true understanding of biology. *912 pages, $7.25*

GENERAL BOTANY **By William Taylor and Richard J. Weber, *Professors of Biology, Georgetown University***
The more carefully you examine this functional new text, with its many realistic modern illustrations, the more surely you will conclude that you could not find a more effective introduction to botany. In a skillful blending of physiology and morphology, plant organisms are described precisely as they occur either in masroscopic or miscroscopic aspect. *376 pages, $5.75*

WRITE FOR EXAMINATION COPIES.

D. Van Nostrand Company, Inc. 120 Alexander Street Princeton, N. J.

The University of Chicago Press

THE CHEMICAL DYNAMICS OF BONE MINERAL

By William F. Neuman and Margaret W. Neuman

The strange paradox of the blood-bone equilibrium at last finds its logical resolution in this up-to-the-minute summary of current information on bone mineral and its contribution to and control by physiological processes. Now it is possible to solve such long-puzzling problems of skeletal physiology as: the mechanisms of the calcification process; the chemical inertness of much of the mature skeleton; the homeostatic control of serum levels of calcium and phosphate; and the mechanisms underlying the actions of vitamin D and parathyroid hormone.

$5.00

THE VERTEBRATE VISUAL SYSTEM

By Stephen Polyak, M.D.
Edited by Heinrich Klüver

All existing knowledge of the visual system of the vertebrates has been amassed in this monumental volume by the late Dr. Polyak, one of the world's leading experts on the subject. Visual mechanisms are discussed from historical, anatomical, histological, physiological, biological, and pathological standpoints.

Consistently interpreting both specific structures and the whole visual mechanism in terms of their functional and adaptive value, Dr. Polyak shows vision and its anatomical substratum as the most important evolutionary tool of the vertebrates and as the most vital factor in the emergence of Man from infrahuman forms. No other book on the visual system in any language has such vast scope. *1,408 pages, 551 illustrations, 27 in color, and a bibliography of over ten thousand references.* $45.00

MORPHOLOGICAL INTEGRATION

By Everett C. Olson and Robert L. Miller

The central theme of this book is the concept of the organism as an integrated, functional unit. It is the first practical and meaningful approach to the place of the total organism, or the totality of some system of the organism, in studies of evolution.

Ever since studies of morphology were first undertaken, the importance of correlating the structural parts of an individual animal has been recognized. Not until now, however, has this idea been given a workable basis so that it could be systematically applied to problems of biology and evolution.

Using both new and established biometric techniques, *Morphological Integration* offers a new methodology for the re-examination of old problems and reveals an array of new areas of research.

$10.00

ANIMAL BEHAVIOR

By John Paul Scott

The study of animal behavior has fascinated mankind since the days of Solomon and Aesop. In recent years, fable has given way to facts which have deep implications for our understanding of human nature.

The most important thing about an animal is what it does, and most of the facts of anatomy, physiology, embryology, and ecology can be related to its behavior. Spanning the fields of biology and psychology and integrating the material from both, *Animal Behavior* leads the way toward a new and more meaningful organization of the general biology course. $5.00

THE UNIVERSITY OF CHICAGO PRESS **5750 ELLIS AVENUE, CHICAGO 37, ILL.**

LOURDES is pleased to announce the following *NEW PRODUCTS

* CONTINUOUS FLOW SUPER-SPEED CENTRIFUGE ROTORS

(Pat. App'd For)

This new design angle type superspeed centrifuge rotor offers continuous forces up to 35,000 X gravity. The inside of the rotor is hollowed out with angled walls sloping downward to accommodate a polyethylene bag of similar shape. A stainless steel cover screws onto the rotor for sealing purposes.

Materials to be centrifuged are introduced from a central inlet tube and the lighter mediums are continually discharged into a surrounding stainless steel collector by means of a unique discharge cap which is attached to and turns with the cover. Heavier particles are forced downward as they impinge on the angular wall. This same rotor may be used for batch separation by use of a threaded sealing plug in the cover.

By simply replacing the polyethylene bag liner the rotor is ready for a new run or for continued operation. There is no need for rotor removal, rotor cleaning, or for handling of test tubes with sealing caps and individual lines to both inlet and outlet ports.

The considerable distance between the inlet tube and the ports of the outlet cap allows for faster and better separation. If inlet and outlet ports were close to each other, materials introduced would be discharged in almost the same form unless the rate of flow were very slow. Available in two sizes, these rotors offer high speed and force and greater capacity than any other super-speed continuous flow centrifuge.

* FULLY AUTOMATIC SUPER-SPEED CENTRIFUGES

- FULLY AUTOMATIC ROTOR ACCELERATION
- PUSH BUTTON DYNAMIC BRAKING
- ROTOR UNBALANCE ELECTRICAL SAFETY TRIP
- REMOVABLE PANEL FOR REMOTE CONTROL
- ACCOMMODATES ALL LOUDRES' ROTORS INCLUDING CONTINUOUS FLOW
- COMPLETE INSTRUMENTATION INCLUDING ELECTRIC TACHOMETER & TIMER
- COMPLETE SAFETY CONTROLS INCLUDING FORCED RESET RELAY
- HEAVY DUTY VENTILATED STEEL SAFETY TANK

* THREE LITER CAPACITY ROTOR—SUPER-SPEED

As a follow up to the popular VRA rotor (1500M1.) this new rotor machined from a radial grained duralumin forging has six compartments for 500 ml bottles. It is the first rotor of its type which will spin such large capacity at forces exceeding 10,000 x gravity.

* LARGE CAPACITY HOMOGENIZER

Similar in design to the smaller Multi-Mixer but with a higher horsepower motor for homogenizing within larger containers.

* REFRIGERATED CENTRIFUGE **(Pat. App'd For)**

The model LR is now available with fully automatic rotor acceleration. This is the same centrifuge, with its completely new refrigeration design, which has offered a higher standard of performance to so many users since it was introduced little over a year ago. This performance is made possible by a combination of increased surface cooling area, proper baffling of the natural air stream coming off the spinning rotor, and by providing a continuous cooling air stream to the bearing and under side of the rotor.

All Lourdes' rotors (including the new continuous flow rotors) are directly usable in the model LR.

These new products will be among those displayed by Lourdes at many of the forthcoming Society meetings. Further details will be promptly furnished upon request. Refer to BS68.

LOURDES instrument corp.

53rd Street & 1st Avenue, Brooklyn 32, New York

ENLARGE THE SCOPE OF YOUR BIOLOGICAL INSTRUCTION WITH THESE SAUNDERS BOOKS

***New!* Villee, Walker and Smith—**

GENERAL ZOOLOGY

A unique presentation of vertebrate and invertebrates emphasizing anatomy, habitat and mode of life. The text blends discussions of broad biological principles with a thorough examination of certain representative animals. The general concepts basic to the study of form and function of both vertebrates and invertebrates are clearly explained at the beginning of the book. Each invertebrate phylum is featured in a separate chapter including a detailed study of one or more representative species. The presentation of each phylum concludes with a survey of its classes and major orders. The vertebrates are introduced with a detailed consideration of the frog as a representative chordate. A history of the vertebrates provides an introduction to the morphology and physiology of the several organ systems. Evolution, genetics and ecology are clearly discussed.

By CLAUDE A. VILLEE, Harvard University; WARREN F. WALKER, JR., Oberlin College; and FREDERICK E. SMITH, University of Michigan. 877 pages, 6" x 9¼", with 444 illustrations. $7.50. *New!*

***New!* Fisher and Kitzmiller—**

LABORATORY EXERCISES IN GENERAL ZOOLOGY

This new manual is ideal for use with *Villee, Walker and Smith's General Zoology* (see above). In general, its organization and topics are the same. It may, however, be used effectively with any zoology text. The manual presents laboratory exercises on the principles of biology in a comparative manner—without a welter of confusing detail. Each of the 34 exercises is preceded by unusually clear and concise introductory statements providing background information necessary for student interpretation of laboratory work. All the "classical" animals of beginning zoology courses are included. You will appreciate the unusually fine exercises on genetics, reproduction, evolution and ecology which are seldom found in laboratory manuals. Throughout the book functional aspects, as well as pure morphological aspects, are emphasized.

By HARVEY I. FISHER, Ph.D., Chairman, Department of Zoology, Southern Illinois University, Carbondale; and JAMES B. KITZMILLER, Ph.D., Chairman, Department of Zoology, University of Illinois, Urbana. 227 pages, 8½" x 11", illustrated. $4.00. *New!*

Third Edition!

Villee—

BIOLOGY

This basic college text presents the major facts and principles of modern biology with a skillful blend of generalization and rich, descriptive detail. Beginning with a discussion of the scientific methods of investigation, the author presents a total picture of botany, the invertebrates and vertebrates . . . from cellular function through body systems. Evolution and ecology are also covered. Of special note are the discussions on cell structure and function, integrating basic physics and chemistry with their biological applications. The material is comprehensive, accurate, well written and fully illustrated. Each chapter is designed to interest students. The student is given all the information he should acquire in a college biology course, but he is never overloaded with facts beyond his understanding.

By CLAUDE A. VILLEE, Harvard University, 615 pages, 6½" x 10", with 323 illustrations. $6.75. *Third Edition!*

Gladly Sent to College Teachers for Consideration as Texts!

W. B. SAUNDERS COMPANY — **West Washington Square Philadelphia 5**

Timely McGRAW-HILL Books

PRINCIPLES OF GENETICS

By E. W. SINNOTT, Yale University; LESLIE C. DUNN and THEODOSIUS DOBZHANSKY, Columbia University. *McGraw-Hill Publications in the Botanical Sciences.* New Fifth Edition. 459 pages, $6.75

A very complete and modernized new edition of a standard senior-graduate reference work in genetics. Changes include the addition of ten new chapters and considerable expansion in the amount of material dealing with human heredity throughout the book and on the genetics of microorganisms. All illustrations have been redrawn; more than half are new. An entirely new appendix chapter on biometrics and probability methods has been added.

FOUNDATIONS OF EMBRYOLOGY

By BRADLEY M. PATTEN, University of Michigan. *McGraw-Hill Publications in the Zoological Sciences.* 578 pages, $10.50

Designed for a first course in embryology and to serve as a foundation for subsequent advanced work for zoology majors and medical students. It offers the student an opportunity to learn something of the processes involved in the start of his own life, without becoming overly technical. Vertebrate development is presented as simply and clearly as possible with an abundance of outstanding illustrations (24 of them in color). Recent advances are correlated with embryonic structural features.

FIFTY YEARS OF BOTANY

A Golden Jubilee Volume of the Botanical Society of America

Edited by WILLIAM C. STEERE, Stanford University. 640 pages, $10.00

A collection of 40 papers showing the progress in the many areas of plant sciences over the past 50 years. Interesting and nontechnical, they are designed to give the student information on what botany is and what the botanist does. The papers stress the importance of plant science to man and his culture, and point up the future potentialities.

PLANT BREEDING AND CYTOGENETICS

By FRED C. ELLIOTT, Michigan State University. *McGraw-Hill Publications in the Agricultural Sciences.* 395 pages, $8.50

This up-to-date review of the general field of plant breeding emphasizes biological principles and the genetic systems under which plants reproduce. Methods of breeding, testing and maintenance of new varieties are outlined. The approach is distinctive in its emphasis on cytogenetics in relation to plant breeding. Recent advances, such as the possibilities of mutation breeding; chromosome substitution and aneuploid analyses; and the significance of recombination in plant breeding have been included.

COMMERCIAL FLOWER FORCING

By ALEX LAURIE, D. C. KIPLINGER, and KENNARD S. NELSON, Ohio State University. New Sixth Edition. 509 pages, $9.50

An extensive revision of a standard text in the field for floriculture courses, and a reference guide for commercial florists. It covers all phases of flower growing under glass—the status of the industry, selection of site, erection of physical plant, applied plant physiology, marketing, and production costs. Emphasis in this new edition is placed on the reasons underlying various operations, with the new subjects of Greenhouse Air-Conditioning and Plastic Greenhouses introduced.

SEND FOR COPIES ON APPROVAL

McGRAW-HILL BOOK COMPANY, INC.
330 West 42nd Street New York 36, New York

Education for Tomorrow

PERHAPS the greatest impact that the "space age" has had yet on the biological sciences has been the general re-evaluation of our thinking toward education in the sciences and in biology particularly. We are not alone in this. The physicists have produced a high school course on film and are in the midst of a thorough-going study of the high school curricula. The chemists are this year filming a high school course. The mathematicians have just begun a high school curriculum study at Yale University. Discussions of similar projects are now under way among the geologists and meteorologists.

The first standing committee authorized by the AIBS Governing Board at the time the Institute incorporated in 1955 was a Committee on Education and Professional Recruitment. Projects which would contribute to more effective teaching have been actively discussed during the past three years by the Education Committee under the able Chairmanship of Dr. Oswald Tippo of Yale University. Within a year after its establishment certain proposals had been so well formulated that informal discussions were begun with several foundations to determine whether or not financial support could be obtained. Plans are now far enough advanced that it is well to outline them for the community of biologists.

The most ambitious proposal is for an extensive study of the course content of high school and college biology courses. Such a study would take at least two and probably three years to complete. The primary, in fact only, purpose is to set forth what a well-educated person should know of the life sciences. We propose to use upwards of 100-150 of the leading biologists in various disciplines. Their thinking and experience would be focused upon the development of a course at the high school level and of courses at the college level which would, ideally, impart to students those major biological principles which every educated person should know. A study of this magnitude, if it is done right, is an apalling task. First, the present course offerings must be divested of much material which, though valuable, will likely be forgotten by the student immediately after he takes an examination covering it. The course syllabus should be vital and stimulating. It should be designed around a half dozen or so of the basic principles which underlie and unify all fields of biology. Further than this, however, there should be developed by this curriculum study a series of recommendations involving the design of textbooks, lab manuals and teacher aids, the production of supplementary films, film strips, charts and models, modifications of present in-service and pre-service training of teachers, etc. Many corollary projects may be recommended such as a series of monographs, and the establishment of review journals directed to the high school and college levels.

Any course or courses so designed must be flexible. Freedom of choice must be allowed for resourceful teachers and the course must be inherently capable of being revised and brought up-to-date. The thinking of many different types of biologists will have to be utilized in this study. The National Association of Biology Teachers, a Member of the AIBS, will be an invaluable asset in this study.

The effect of a completely redesigned set of courses will not begin to be felt for a number of years. The design of courses probably will take three years. The developmental phase leading to textbooks, lab manuals, visual aids and the like will consume at least two to three additional years. A period of experimentation of one to two years must follow to eliminate "bugs" from the courses. Within 8 to 10 years, therefore, these courses should begin to have far reaching effects upon high school and college students.

A second project is being proposed by the AIBS frankly as an interim measure—a "crash program" if you will. A filmed high school course could be completed within 18 months and would begin to have an impact within three years. This filmed course would be comparable to those now offered in physics and being developed in chemistry. It will in no sense replace the many excellent high school courses that are being given throughout the country. It should improve the biology course offerings in the many thousands of high schools which, for a number of reasons, cannot now offer biology courses of a high caliber. This filmed course will consist of some 140 thirty-minute films. A syllabus for the course will be developed over a period of about three months by a group of perhaps 15 of the most outstanding university, college and high school teaching biologists that can be assembled. Although the lectures and demonstrations will be given by one man, each phase of the course will be monitored by a small panel of specialists in that field. After development of the syllabus, the course should be filmed in about 9 months. There will then follow about three months of editorial work, revision, and refinement, etc. so that this course should be available to high schools in 1959.

Another experimental project which was proposed over two years ago by our Education Committee is to develop two pilot films in biology teaching at the college level. The purpose of the project is to produce two films under ideal conditions so that, presumably, they will be available as the best possible models of teaching films at the college level. The films will be used under controlled conditions to determine significant differences between teaching "live" and teaching by films. The subjects of the films are "Meiosis" and "Evolution." Each will be done by an eminent teacher with the aid of an advisory panel of four to six persons.

Most of you are familiar with the Visiting Biologists Program sponsored by the AIBS with support of the National Science Foundation and the Atomic Energy Commission. From every report that reaches this office the Program has been an outstanding success. Now that the Program has completed its second full year of operation we have certain data by which it can be evaluated objectively. We know of specific instances where first rate students have decided to enter biology as a career because of the stimulus given by our visiting biologists. We know of the great increase in interest in the biological sciences in communities where our lecturers have visited. There is a high percentage of repeat requests for visiting speakers. Our speakers have visited many institutions where there have been no outside speakers in the natural sciences for years. We feel that a logical extension of this college Visiting Biologists Program is into the high schools. We propose to establish a second Visiting Lecturers Program for 1958-59 aimed specifically at high schools. The panel of speakers necessarily would be different for the high schools than for the colleges. We hope that these visitors will be utilized not only in high school classes and assemblies but by PTA groups, civic clubs, school boards, and other organizations which have an interest in secondary schools in each local situation.

None of these projects takes the place of the old time log with a teacher at one end and a student at the other. None replaces the dedicated, well-trained, enthusiastic, teacher working daily with a small group of young people. None takes the place of the inspired teacher lecturing even to a large group of students. Nevertheless, we feel the teaching of millions of high school and college student will be improved significantly by these and other measures. The problem is great. It will not become less until thoughtful, visionary and far reaching measures are taken. We feel that the AIBS has the responsibility to move forward as rapidly as possible in the field of biological education.

HIDEN T. COX, *Executive Director, AIBS*

Antarctic Microbiology

A Study of Antarctic Birds Conducted During the 1957-58 Argentine Antarctic Expedition

JOHN McNEILL SIEBURTH, *Virginia Polytechnic Institute, Blacksburg*

MOST of the information on antarctic bacteriology was obtained during the great decade of south-polar exploration following the turn of the century. These studies conducted by the ships' physicians were prompted in part by the report of Levin in 1899 that arctic birds and seals at Spitsbergen were free of bacteria. The studies by Gazert on the German expedition, Ekelöf on the Swedish expedition, Harvey Pirie on the Scottish expedition and MacLean on the Australasian expedition reported that 50 per cent or more of the birds studied were "bacteriologically sterile". Bunt as recently as 1955 also reported the existence of "bacteriologically sterile" birds. The purpose of this study was to reinvestigate the microflora of antarctic birds to determine if "bacteriologically sterile" birds do exist, if dietary factors influence the microflora and if avian diseases transmissible to man occur in antarctic birds.

This study was part of a broad antarctic program requested by the Society of American Bacteriologists to be conducted during the IGY. A survey conducted by Dr. R. H. McBee indicated that work aboard American ships was virtually impossible and recommended land based studies. A proposed study based at the U. S. IGY Wilkes Station failed to gain support. An opportunity to join the 1957-58 Argentine Antarctic Expedition aboard the icebreaker "General San Martin" was accepted. The project was catalyzed by the AIBS, and supported by the Arctic Institute of North America (ONR subcontract), the Hydrographic Service of the Argentine Navy and Virginia Polytechnic Institute. A minimum of supplies was taken along and with the gracious help of the Argentine Navy's Hydrographic Service all the necessary materials and supplies were obtained in Buenos Aires to outfit a temporary bacteriology laboratory in the ship's tiny pharmacy. The only minor technical catastrophes encountered during the voyage were the high incidence of mold contamination which was solved by the use of tubed media and the lateral roll of the icebreaker which often reached 45° in an 8 second cycle which was extremely hard on glassware as well as the tender stomach of this writer.

The voyage from Buenos Aires to Ushuaia, Tierra del Fuego Island, was uneventful and was spent setting up shop. Ushuaia, which is surrounded by beautiful mountains and claims to be the southernmost city in the world, is mainly an Argentine Naval base and a village with dirt streets, quaint houses and numerous horses. The first bird collected at this site was a Skua Gull which had a tracheitis associated with coliform organisms which were later shown to be pathogenic for chickens. Two of the other three flying birds studied for their respiratory flora had this condition. None of the penguins had a detectable respiratory flora.

The trip across Drake Passage was a constant rock and roll, but was much milder than anticipated from my reading as a youth of the rough rounding of Cape Horn by the early sailing ships. As we neared the South Shetland Islands, icebergs and porpoising Gentoo Penguins were sighted. The first base visited was that of "Teniente Camara" on tiny Half Moon Island. I soon found that the climate was invigorating, but not cold, and that penquin catching for the uninitiated was exhausting. As everywhere in Buenos Aires and at the Argentine, British and Chilean bases, I was warmly greeted and given all the help and information needed. My Spanish vocabulary which consisted of 'Gringo' and 'adios' and similar words learned from being a 'Western' fan soon expanded to that of a 3 year old child's, but no further. The penguin obtained at Camara was free of aerobic bacteria and in the light of previous work this bird might have been considered "bacteriologically sterile". However, this bird, as did all the others that were free of aerobes, had a detectable anaerobic microflora.

Hope Bay on the tip of Palmer Peninsula was the next stop. The Argentine Army base of "Esperanza" and the British Falkland Island Dependancies Survey Base D "TrinityHouse", which are side by side, were visited. Dr. Simpson, the physician at the British base who did a very interesting study on the relation of endocrine function to physical and emotional strains, took me on a tour of the area at an exhausting pace for an armchair scientist. The mosses and lichens were numerous on the snow-free jagged rocks and the Adelie Penguin chicks were just hatching in the 60,000 penguin rookery. This area, complete with penguins and many species of flying birds, the fresh water Lake Boekella with fauna and flora, a rich crytogammic flora, fossil beds with animal and plant forms, depot glacier, and the rich marine waters is a biologist's dream. Discussions with the Skipper, Captain de Fragata Luis R. A. Capurro, a physical oceanographer and a well known scientist in his field, led to plans for using the vacant Naval Base of Esperanza as a permanent summertime Antarctic biological experiment station. This station would be a comfortable base of operation for scientists in the natural sciences from Argentina, North America and Europe to study this and adjacent areas serviced by the Argentine Antarctic Naval group. As yet plans have not crystallized but, if arrangements can be made in time, the first group to spend the 3 to 4 month Antarctic summer there will embark this November.

The next scheduled stop was Laurie Island in the South Orkneys. However, the pack-ice kept the ship circling for a week. The voyage took on a grim but exciting tone when the "San Martin" was recalled to Hope Bay to search for a lightly

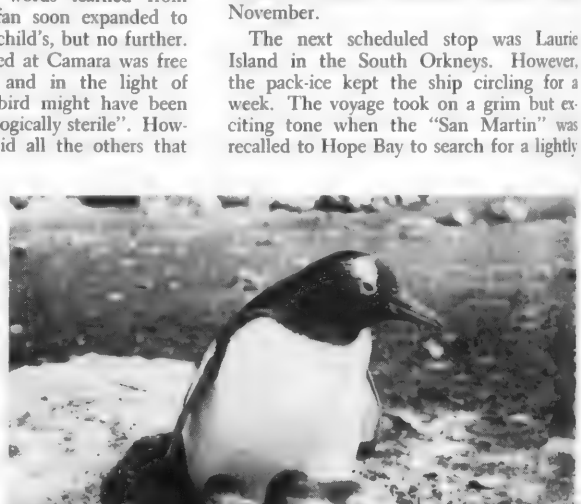


FIG. 1. *Gentoo Penguin with one month old chicks on Southern Thule Island, southernmost Sandwiches.*

FIG. 2. *Left to right. Dudley Dunlop, Dept. of Oceanography, University of Miami; Lt. Juan Miranda, Argentine Navy; Guy Franceschini, Dept. of Oceanography, Bryan, Texas; author.*

clad soldier who had been blown to sea in a small open boat. The search, which utilized the talents of navigators, meteorologists, helicopter pilots and the skipper resulted in a successful rescue 22 hours later despite cold weather, a rough sea and snow blizzards. Changed plans took us down the west coast of Palmer Peninsula to the base of "Almirante Brown". This base suffered a damaging fire during the winter as did the "General Belgranö" base in the Weddell Sea which lost all the IGY data collected during the year.

A Gentoo Penguin obtained at "Almirante Brown" gave the first clue that antibacterial substances were present in food material. The food of the penguins studied consisted almost solely of the Euphausian Shrimp *Euphausia superba*. Dissected shrimp indicated that the antibacterial activity was located in their bright green phytoplankton laden stomachs. Sea water phytoplankton samples taken at the various hydrographic stations on the trip into the Weddell Sea indicated a marked antibiotic activity in concentrations as low as 5 parts per million on a dry weight basis. A similar differential antibiotic activity was exhibited by the phytoplankton, the shrimp eating the phytoplankton and the stomach contents of the penguins that had been feeding on the shrimp. This marked antibiotic activity of phytoplankton, which appears to affect Gram positive bacteria to a greater extent than Gram negative bacteria, may be responsible not only for the 'aerobe-free" birds but may play a major role in the bacterial ecology of antarctic fauna, as all animal forms feed either directly or indirectly on phytoplankton.

The period between Christmas and New Year's was spent at "Teniente Camara" while the "San Martin" returned to Ushuaia for refueling, supplies and personnel. During the day shrimp and serum were collected on excusions to the Ringed Penguin rookery and along the rocky shoreline. The evenings were spent discussing many topics with my Argentine hosts and pursuing my hobby of amateur radio which kept me in contact with my family. A side trip via helicopter to the neighboring Chilean Naval Base of "Arturo Prat" was most interesting. A chicken flock of 72 birds and a herd of 27 sheep had been brought in with a year's supply of bedding and feed in order to furnish fresh eggs and fresh mutton. My professional services were called upon as cannibalism had broken out among the chickens in their cramped quarters aboard ship and one hen had the symptoms of Newcastle Disease. However, a week later they were doing well and supplying 2 eggs daily per man.

After rejoining the "San Martin," the weather station at "Orcadas" on Laurie Island in the South Orkneys was finally visited. A shoreside cemetery, the final resting place of Scandinavian fishermen and Scottish and Argentine personnel, is mute testimony of the rugged life in this lonely area. The Scottish expedition led by Bruce built the stone Ommond House in which Dr. Pirie conducted bacteriological studies in 1903. The following year this weather station was given to Argentina which has manned it continuously since that time. The stone walls and hardwood floor of Ommond House as well as stone crocks, barrels of salt pork and 1901 magazines still remain. The Nordenskjöld stone house at Hope Bay also remains as a tribute to the men of this great era of south-polar exploration.

On the way into and out of the Weddell Sea a northern route was taken in order to visit Islands in the South Sandwich chain. On this trip as on many others I was one of the few given shore privileges via a helicopter flight. The frequent opportunities to go ashore and the sincere interest of Capitan Capurro in my work made this study possible. The southernmost island in the group, Southern Thule, can best be described as a feces-covered, penguin-overpopulated volcanic island. The northernmost island, Zavodovski, has an active volcano. Even at a distance of several miles the sulfuric fumes were quite strong and the large volume of smoke coming from the crater gave an eerie feeling. Shortly before our visit, Britain filed a complaint to the U.S.S.R. for building a small refuge on this island. Despite the imminent dangers of this island thousands of Ringed Penguins and a few Macaroni Penguins populate it. A Skua Gull and a Giant Petrel soaring over the penguins rookeries were obtained for study. The stomach contents gorged with remnants of penguin chicks exhibited a strong antibacterial activity and completely inhibited the aerobic flora of a Giant Fulmar. On the supposition that the inhibitory effect of the tissues was due to blood serum, the antibiotic activity of serums from various species was tested. All serums inhibited at a dilution of 1:20 and half inhibited at least as high as a 1:160 dilution. Since serum constitutes approximately 1/20 the volume of a bird this antibacterial activity of blood serum could account for the marked modification observed in the gastrointestinal microflora of the predatory flying birds.

After crossing the Antarctic Circle the night which had been a short 4-5 hours began to disappear. Preparations were made to welcome King Neptune and his court. A messy but very humane ceremony initiated us pollywogs—ranging from the lowliest conscript to Admiral Patron-Laplassete, the group commander — to the Argentine equivalent of a shellback complete with diploma. As we approached our destination of "General Belgrano," an army base on the Weddell Sea shelf ice, the American ships Westwind and Wyandot were sighted. Unlike the British ship Shackleton and the Chilean Ship Angamos, an invitation for a visit was declined. "General Belgrano" is a cold austere dimly lit and cramped base with a minimum of equipment which is in marked contrast to the luxurious U.S. IGY base of Ellsworth Station 35 miles away. Despite the less luxurious quarters and equipment at the Argentine, British and Chilean bases these men are doing a wonderful job that they can be proud of. The only penguin studied at "Belgrano" was an adult Emperor Penquin which had been held captive 15 days without food. Despite the starvation this bird contained an abundant oral and rectal flora.

On the way out of the Weddell Sea a visit was paid to the Royal Society Base of Halley Bay. These lads were fired with enthusiasm and were very proud of their

FIG. 3. *Destaamento Naval de Esperenza, at Hope Bay, tip of Palmer Peninsula, site of proposed naval Antarctic Experiment Station for Natural Sciences.*

work and the successful South-Pole trek of Sir Vivian Fuchs which had been completed a few days earlier. The replica of an English tavern complete with fireplace, beamed ceilings, spiderweb, etc., gave a real homey feeling to the base. An Emperor chick obtained at Halley Bay had been feeding on highly acidic cephalopods which apparently selected an aciduric coliform microflora.

A revisit to Lauric Island completed the bacteriological studies. A total of 28 birds were studied which answered the questions about the "bacteriologically sterile" birds previously reported, indicated the nature of the respiratory flora, demonstrated the effect of diet on the gastrointestinal microflora and unexpectedly revealed the highly potent antibiotic properties of sea water phytoplankton. This antibiotic activity of the phytoplankton explains at least in part why sea water with nutrients sufficient to support millions of bacteria per ml. only contains 10 to 200 planktonic bacteria per ml. The remainder of the time aboard the "San Martin" was spent preparing stock bacterial cultures and preserving serum and specimens for shipment back to Virginia. The serum samples were used for the serological detection of avian diseases transmissible to man. Evidence was obtained which indicates that Salmonellosis and Ornithosis are present in antarctic birds. A number of bacterial isolates are being identified and preserved tissues will be studied by pathologists and parasitologists. After a stop at Hope Bay the "San Martin" rendezvoused at Deception Island (the main Argentine Antarctic Naval base) with the transport "Bahia Aguirra" and the first tourist ship to the Antarctic, the "Les Eclaireurs". Although I was scheduled to travel back on the "Bahia Aguirra" the shorter travelling time and numerous senioritas aboard the tourist ship shifted plans. Just five days later I was back in Virginia, sick with my first cold in months, but with my wife and children. Although this exciting, educational and successful trip has ended, the friendships, memories and experience will always remain. The scientific results squeezed out under difficult conditions will, I hope, encourage other biologists to challenge the cold continent which still holds many secrets. For those adventuresome biologists who are not quite ready to jump into space-biology the last frontier on earth still remains.

References

Bunt, J. S., 1955. A note on the fecal flora of some antarctic birds and mammals at Macquarie Island. Proc. Linn. Soc. New South Wales. *80*:44-46.

Ekelöf, E., 1908. Bakteriologische studien während der Schwedischen Süd-polar expedition. Wissenschaft. Ergeb. d. Schwed. Sudpol-Exped., 1901-1903, Bd IV, Lief. 7, Stockholm.

Gazert, H., 1912. Untersuchungen uber Meeresbakterien und ihren Einfluss auf den Stoffwechsel im Meere. Deutsche Sudpolar Expedition 1901-1903. Bd VII, Heft III pp. 268-296. Georg Reimer, Berlin.

Harvey Pirie, J. E., 1912. Notes on antarctic bacteriology. Scottish National Antarctic Expedition. Report of the scientific results of the S.Y. "Scotia", Vol. 3 Botany, No. 10, pp 137-148 Edinburgh.

Levin, M., 1899. Les microbes dans les regions arctique. Ann. Inst. Pasteur, *13*:558-567.

McLean, A. L., 1919. Bacteriological and other researches. Australasian Antarctic Expedition. 1911-1914. Scientific Reports, Series C. Vol VII, Part 4. pp. 15-44. Sydney.

Is Biology Obsolete?

WALTER P. TAYLOR, *Department of Zoology, Southern Illinois University*

IT IS astonishing what a couple of sputniks, tearing about the Earth in their orbits, have done. On the whole, the results have been wholesome.

Among other things, the sputniks have shown up a certain instability on the part of the American people. Consequently, we recently have heard some near hysterical outpourings which do us little credit. For example, threatened economies in general education, in contrast to scientific specialties, have become so serious that a number of educational leaders have felt called upon to protest that our future welfare can better be assured by strengthening our educational program as a whole, than by undue emphasis on only two or three areas of apparent immediate concern. There is always a chance that we shall perfect our defense at the expense of the only things worth defending, namely, our broad and humane culture, our favorable environment, and our democratic way of doing things.

At the outset let me make a few remarks about the scientist as a member of society, since the scientist, from a position of relative peace, quiet, and obscurity, has suddenly been plummeted into the limelight. The realistic reappraisal of the status of the scientist in our society long has been overdue.

When our ancestors arrived from overseas and settled North America, there were extended frontiers, an abundance of new land, seemingly inexhaustible soils, waters, forests, grasslands, wildlife, and minerals. Our forefathers were able to take, and did take, what they wanted in any desired quantity pretty much when they wanted it. Unfortunately, we still retain something of the same impression of inexhaustibility of resources our fathers had but, alas, minus some of the resources. Even now, in spite of all efforts to the contrary, we continue to deplete our forests, to mine and erode our soils, to overgraze our grasslands, to drain our valuable marshlands, to exhaust our fossil fuels, and to exploit certain others of our strategic materials.

Along with these actions, we exhibit a child-like faith in the ability of the scientist to conjure up remedies, including substitutes for scarce materials. Here a paradox appears. For all this seeming faith in the scientist and reliance on his ability the people become somewhat absent-minded when pay day comes around!

Recently McGraw-Hill (1957) put out a short but devastating folder on faculty salaries. This shows that while there indeed has been a gain in university faculty pay rates of some 12 per cent over what they were 16 years ago, the advance in the compensation of lawyers in the same period has been 25 per cent; of industrial workers, 60 per cent; and of physicians, more than 90 per cent.

Not long ago (St. Louis Post Dispatch, Oct. 31, 1957), President Nathan M. Pusey reported that the base pay of Russian college professors is equivalent to $18,000 a year in terms of purchasing power, as compared with the average American professor's salary of $5,400. Further, he pointed out that Russian college professors enjoy top status, in terms of prestige and pay, among professional groups. Can we doubt that, since teachers as a group are the only Americans who have lost ground economically in the last 25 years, many superior minds are being diverted to other lines of work? President Pusey termed the prevailing low salary scales for teachers about the most serious national problem we have.

There also is almost total unawareness, on the part of the public, of how the scientist becomes a scientist. The long years of expensive preparation, the meticulous requirements of scientific work, the painstaking drudgery that accompanies much of it, which are involved in keeping alert and up to date are simply not understood. A current indication of this is the suggestion that a crash program in scientific research be adopted to catch up with the Russians. Unfortunately, science and education do not progress quite in this way. It's like thinking you can produce a baby in one month by making nine women pregnant (T.R.B., 1958).

Anybody who has got as far as the sophomore year knows that science is all-inclusive, a sort of continuum, being man's total efforts to learn something definite about the universe he is living in. As one grows in insight, he learns that there are no rigid boundaries between the abstracted aspects of reality we know as physics, chemistry, geology, botany, zoology, etc. Each fades into the other. Unfortunately, this is not always the current conception. One has only to read the daily papers to awaken, with something of a start, to find that to many persons, some in very high places, present day science includes, for practical

purposes, only physics, chemistry, engineering, and mathematics. If biology rates at all, it is in the apocrypha at the back of the book (Cox, 1958).

For example, announcement has been made (Indianapolis Star, Dec. 28, 1957) that the Administration proposes to spend some $200,000,000 to $250,000,000 in the first year in improving American education. The program would involve both the National Science Foundation and the Department of Health, Education and Welfare. Specific items include the expansion and improvement of science and mathematics teaching in the high schools, federal scholarships for talented high school pupils, federal fellowships in graduate schools, help to the states in counselling high school pupils, and promotion of foreign language teaching. There is no mention of the biological field except as it might be included under the general term of science.

Throughout Secretary Folsom's (Department of Health, Education and Welfare) memorandum for President Eisenhower on this subject (St. Louis Post Dispatch, Jan. 2, 1958) there is pointed emphasis on "science and engineering," a phrase mentioned not less than ten times. On rereading the memorandum, in an effort to discover what the writer meant by "science," we find reference to chemistry and physics only. Biology is conspicuous by its complete absence!

On December 10, 1957, a symposium was held on how to meet Russia's scientific advances (Indianapolis Star, Dec. 29, 1957). The participants were three leaders in American education: President Henry Heald, Ford Foundation; Howard L. Bevis, chairman of President Eisenhower's Committee on Scientists and Engineers, and Lawrence G. Derthick, United States Commissioner of Education. The detailed newspaper account of the symposium contains abundant reference to science, mathematics, chemistry, physics and engineering, but there is not a single solitary reference to biology or any of its branches.

By this time the almost fantastic action of the Civil Service Commission in granting pay increases to "scientists" employed by the Federal Government, under Civil Service, is common knowledge (see AIBS Bulletin 8(1):11, 1958). As a former federal biologist, the present writer confirms Cox's statement that there will be a lowering of morale among federally employed scientists. It cannot be doubted, as asserted by Cox, that a policy which places stronger emphasis upon certain fields of science than on others is short-sighted.

There is no excuse for anyone to underestimate or depreciate the value and importance of physics, chemistry, engineering and mathematics. The physical sciences, so vital to the public interest, are vital to biology itself. It is also true—and biologists may well summon the physical scientists to concede and strengthen this inevitable corollary, namely—that biology is equally important to the physical sciences.

After all, no appropriation of money, no investment of time, no expenditure of effort, in the fields of physical science, is of the slightest concern or meaning to us human beings, at least, except in relation to the living matter of which we are composed. Among the most complicated molecules in nature are those of protoplasm, the physical basis of life. Infinitely variable, yet fundamentally conservative, their relationships, their structure, their functions are all too little known. Yet how important it is to all of us that they should be better understood. In order to plumb to the depths the complex protoplasmic interrelationships with physical, chemical and other phenomena we ultimately may well find it desirable to appropriate funds and provide support for biological research and development equal to the total of all those sums now contemplated for chemical, physical, mathematical and engineering research! Remember that such relatively simple problems as cancer, leukemia, muscular dystrophy, the common cold, heart troubles, headaches, arthritis, virus diseases, many mental illnesses, are as yet unsolved, although encouraging progress is being made. What of the more difficult problems of man's fundamental biological relations to his world and his universe, to outer space, for example?

The relations of physical phenomena to protoplasm mean increased responsibilities as well as expanded opportunities for biologists. At the symposium on the "Social Aspects of Science as Illustrated by the Radiation Problem" at the meeting of the AAAS in Indianapolis, December 29, 1957, one was impressed with the urgent need for further research on the effects of radiation on living matter. Differences of opinion among the panel members gave unmistakable indication of the shortcomings of information and understanding in this field. The clear consensus of opinion emphasized the potential dangers. The biologist is the custodian of information and principles of vital moment to the present and future welfare of society.

Biologists themselves, as compared with other scientists, are partly to blame for their present lack of status. Over the years William Morton Wheeler's flaming denunciation (1939) of the "Dry Rot of Academic Biology" has been on the record. Sometimes we become so absorbed in our work, so disgracefully specialized, that we become virtual isolationists, almost sterile as members of a functioning democracy. Writes Glass (1957), "Few biologists, outside of an occasional leisure thought, seem to think very frequently or deeply about human progress. This is part of the outcome of that unfortunate cleavage in our pattern of training that most commonly makes the scientist into a narrow technician and the student of the humanities or social studies into a scientific ignoramus. . . . There are so few biologists who endeavor to make their biology count for anything outside the laboratory and the classroom."

It's too late now to quibble or commiserate. The biologists must get under their share of the load. So far as we can see from our present point of vantage, life, the objective of the biologist's inquiry, is the hottest thing in the universe.

Is biology obsolete? Not so long as any one of us remains alive. I submit that if biology is allowed to become obsolete, it will not be long before the human race will find itself in exactly the same sorry predicament.

How then are we reacting to the critical need for substantially increased research and application in the field of biology? Let an AAAS committee (1957) answer:

"Support is heavily slanted toward physical sciences. In 1954, federal research support was divided as follows: physical sciences, 87 per cent; biological sciences, 11 per cent; social sciences, 2 per cent. Industrial research is at least heavily weighted in this direction." Says the committee: "This disproportionate growth of the physical sciences as compared with biological and social sciences to some degree reflects the interests and superior financial resources of the industrial and military agencies that support science." Here really is something to think about. Are these powerful industrial and military forces sufficiently broad, intelligent, and humane in outlook, and dispassionate and well-informed in their interest to justify their control of science?

Now to go on with the committee's report: "The effects of this unbalanced development are already being felt. Generally speaking, we sometimes find ourselves embarking upon new ventures, based on advances in chemistry and physics, before we are adequately informed about their consequences on life or on social processes."

The committee lists, among the signs of trouble: (1) Radiation dangers: It is widely recognized that there is considerable evidence of radiation damage to living matter, more particularly the germ plasm. (2) Food additives: So far it has been impossible to carry through studies of delayed biological effects such as cancer causation. Studies of carcinogenicity have proved to be especially difficult to manage, and equivocal in interpretation. (3) Health hazards: Among these are the fumes, smogs, and dusts from industrial plants and automotive and combustion processes. "Information on the biological effects of a new substance is acquired at a very much slower pace than the rate at which new substances are made or put into use. It is probably inevitable that biological research will move more slowly than either physics or chemistry, but it should be expected, therefore, that we would put correspondingly more effort into research on biological phenomena. The opposite is the case. Less than about 10 per cent of our total research expenditure goes into biology and medicine." (4) Natural resources: These are the major source of our wealth, says the committee. As pointed out by Paul B. Sears (1958), retiring president of the AAAS, changes in our natural resources have occurred without proper consideration for the consequences. The imminent danger of serious floods and

forest fires should have been apparent to those with a relatively elementary knowledge of the landscape and its ecology. Much of the devastating soil erosion, water and air pollution, and depletion of essential subsurface water reservoirs likewise could and should have been avoided by ecologically minded executives. What can be said of the extensive new housing developments, often located in the most vulnerable alluvial fans and flood plains, sitting ducks for disastrous floods almost certain to occur sooner or later?

Lately it has become clear that even in building our spaceships we cannot safely omit biological considerations. In fact, a pilot in high performance aircraft is knocking against the barriers which will confine him to earth. Some of the problems he faces: spontaneous development of disease or disorder; unfavorable, perhaps lethal, environmental influences; mechanical or equipment failures; extraordinary stresses. Travel into outer space, says Dr. Graybiel of the Navy's School of Aviation Medicine (Need Strong Space Men, 1957), exposes the pilot to new and possibly more devastating hazards, prime among them cosmic rays. Who knows the long-time effects of these on human somatic and germ cells? Here is a practical biological problem, doubtless dependent for its ultimate solution on the utmost present and future information obtainable in basic morphology, physiology, metabolism, organization and integration, not only of many lesser forms, but of man himself.

The public should be alerted to humanity's dire need of future research and application of biology. There seems to be no escape from the conclusion that the biologists must participate, increasingly, in public policy making. Perhaps they should take a leaf from the atomic scientists, and give more attention to their responsibility for the use of their own findings. They should make speeches, however distasteful. They should serve on planning committees, take part in public discussions, participate actively in civic concerns at all levels. They should even stand for public office, if that is the most practical way of assisting the community to right solutions.

For becoming active in public affairs, scientists generally, philosophers, and biologists have some precedent. To name a few of those who have been active in public life: Avicenna, Persian physician, mathematician and astronomer (Nordenskiold, 1942); the Arabian Averroes, medical man, philosopher, and lawyer; the French biologist Lyonet, insect anatomist, linguist, and diplomat; the Swiss von Haller, biologist, city official and counselor; Goethe, German minister of state; Esenbeck, German physician and botanist, active in the labor movement of his day; Cuvier, paleontologist, peer of France; Virchow, German physician, interested in the three P's, public health, pathology and politics; Endlicher, of Vienna, botanist; Purkinje, member of the Bohemian Diet; Weismann, biologist who worked for the union of the German states; Davenport and Laughlin, who have had so much influence on our own American immigration policy; Sherrington, English professor who worked on tetanus at a London hospital after hours, and in a munitions plant during vacations; Thomas Jefferson, sponsor of one of the greatest biological expeditions of all time, scientist of astonishing versatility, and President of the United States.

Our standard of living needs critical attention, too. It is customarily assumed that our Western standard of living is high and rising. But instead, there are indications already that we are beginning to suffer from the law of diminishing returns. How about the cost of beef steaks, of housing, of furniture and of heating; the crowding of our highways, and our parking places; the congestion in our schools; the deterioration of our recreational outlets; the pollution of our water and atmosphere; the exhaustion of our natural resources? We import industry and taxes go up, not down. These things do not sound quite convincing as evidences of a rising standard of living. At least, we can perhaps agree that the answers to these vital problems, which affect, directly or indirectly, the health, the welfare, and the comfort of every one of us, depend on the proper analysis of a number of vitally important biological problems, such as for example, birth rate, death rate, biotic potential, food, water, shelter.

One of the best answers I have seen to this question was given by Leake of the University of Ohio (1945), quoted by Allee and his associates in their great work, "Principles of Animal Ecology" (1949):

"The probability of survival of individual living things, or of populations, increases with the degree with which they harmoniously adjust themselves to each other and their environment. This principle is basic to the concept of the balance of nature, orders the subject matter of ecology and evolution, underlies organismic and developmental biology, and is the foundation for all sociology."

Similarly, according to Brown, Bonner, and Weir, of the California Institute of Technology (1957): "We have seen that, in principle, man can, if he wills it, create a world where people can live lives of abundance and creativity within the framework of a free society. . . . The future of industrial society revolves around the question of whether man can learn to live with man."

If man can't learn to live with man, and I may add, with his environment, all of our investigations, whether in the physical or the biological sciences, will be worthless. Furthermore, if humanity is to survive, biology, the stone that the builders rejected, must become the head of the corner.

References

Allee, W. C., A. E. Emerson, O. Park, T. Park, K. P. Schmidt. 1949. Principles of Animal Ecology. Saunders, Philadelphia.

American Association for the Advancement of Science, Interim Committee on the Social Aspects of Science, Ward Pigman, Chairman. 1957. Preliminary Report. Science *125*(3239):143-147.

A Progress Report on Faculty Salaries: Up but Not Nearly Enough. [1957]. McGraw-Hill Publishing Co., Inc. New York, 4 pp.

Brown, Harrison, J. Bonner, J. Weir. 1957. The Next Hundred Years. Viking Press, New York.

Cox, Hiden T. 1958. Where Now? A.I.B.S. Bulletin *8*(1):11.

Glass, Bentley. 1957. The Responsibilities of Biologists. A.I.B.S. Bulletin *7*(5):9-13.

Leake, C. D. 1945. Ethicogenesis. Scientific Monthly *60*:245-253.

Need Strong Space Men. 1957. Science News Letter, p. 257. October 19.

Nordenskiold, Erik. 1929. The History of Biology. Knopf, New York, London.

Sears, Paul B. 1958. The Inexorable Problem of Space. Science *127*(3288):9-16.

"T.R.B." 1958. Washington Wire. New Republic *138*(5):2, February 3.

Wheeler, W. M. 1939. Essays in Philosophical Biology. Cambridge University Press.

Societies meeting under AIBS auspices at Indiana University

American Bryological Society
American Fern Society
American Microscopical Society
American Phytopathological Society
American Soc. for Horticultural Science
American Soc. of Ichthyologists and Herpetologists
American Soc. of Limnology and Oceanography
American Society of Parasitologists
American Soc. of Plant Physiologists
American Soc. of Plant Taxonomists
American Society of Zoologists
Biometric Society (ENAR)
Botanical Society of America
Ecological Society of America
Mycological Society of America
National Association of Biology Teachers
Nature Conservancy
Phycological Society of America
Potato Association of America
Society for Industrial Microbiology
Society for the Study of Development and Growth
Society of Protozoologists
Society of Systematic Zoology
Tomato Genetics Cooperative

The Biologist as Industrial Consultant

PHILIP S. THAYER, *Arthur D. Little, Inc., Cambridge, Mass.*

BIOLOGISTS have been known to stray from university laboratories into those maintained by private industry. While the character of biological research in the industrial world is relatively familiar, less well-defined is the biologist's position in an industrial consultant firm. It may be of interest to biologists in general to learn how their professional colleagues fit into such an organization in terms of their status, contributions, and opportunities for research.

A corporation whose major product is industrial research is unique, different in character from a university, a biological research institute, or the usual industrial laboratory, i.e. in a firm whose major business is production. Arthur D. Little, Inc., of Cambridge, Massachusetts, was one of first industrial research companies in this country—dating from 1886. Projects undertaken by the company vary according to the interests of the staff and the needs of government and industry. Its laboratories are situated across the country, with an affiliate for nuclear metal research in Cambridge and another, mainly for basic research, in Scotland. The biological facilities are located at the main laboratories in Cambridge. The atmosphere at A.D.L. is informal and the administrative organization is sufficiently loose and versatile to provide freedom of operations for shifting teams of chemists, biologists, economists, engineers, mathematicians, physicists, and academic and business consultants.

As a member of this community, a biologist can work on exclusively biological matters, with full responsibility in his hands alone, and at other times he can collaborate, contributing only a portion to a project's outcome. When he becomes involved in give-and-take with men from scientific disciplines other than his own, it demands a professional cooperation well beyond simple acknowledgement of coexistence. Industrial problems involve a complexity of fields, and the success of industrial research therefore is largely dependent upon interdisciplinary creation. Biology, in this climate, assumes many new dimensions, while losing none of its integrity. In his daily encounters, the biologist explores the interrelationships between biology and the other sciences.

The Environment

Within the last four years the number of biologists at Arthur D. Little, Inc., has greatly increased to satisfy the growing industrial demand for biological assistance. The major specialities represented in the present A.D.L. biological staff include biochemistry, microbiology, pharmacology, toxicology, pathology, and veterinary medicine. For programs in other fields of biology the services of outside specialists are obtained, for example, in the organization and establishment of clinical studies.

Work is usually based on a research contract with either industrial clients or government agencies. Less numerous, but no less significant, are non-contract programs in areas of basic research. Work for clients may be as brief as three or four months or may extend over a period of years. In some cases a continuing relationship with a client has resulted in a widely varied series of projects and has lasted as long as thirty years.

In this connection, it should be noted that one of the features of flexibility at A.D.L. is the ability of the company to assemble not only *ad hoc* teams of collaborators, but also *ad hoc* laboratory facilities. Working usually with a minimum of elaborate equipment and exchanging with other operating groups, one can set up a laboratory for a short-term project, without the long-term commitment implied in a less flexible organization. For example, the building used for the *Chlorella* pilot plant described below, is now the animal quarters for the biology group.

The physical facilities currently available at A.D.L. include such common biological apparatus as incubators, sterile rooms, biochemical apparatus, a variety of electronic and other devices for pharmacological research, and a large histopathology laboratory. In short, it is the same type of equipment generally used by the academic biologist. Yet the men working with it are called industrial research biologists. What are the reasons for this distinction? Let us examine the nature of the daily work.

Contract and Non-Contract Work

One major project over the past few years came from the Cancer Chemotherapy National Service Center. It is engaging several consulting laboratories to screen large numbers of chemical compounds and antibiotic filtrates for potential use as drugs in the treatment of cancer. A.D.L.'s part of this project calls for 1,000 tests per month of synthetic compounds, or fermentation products, for their activity on three different transplantable mouse tumors, the work including transplantation, injection, and evaluation of results. Screening by mammalian cells grown in tissue culture is a related project.

The confidential nature of many contracts makes a complete picture of A.D.L.'s or of any other consulting firm's work impossible to portray; however some idea of the scope of this work can be suggested by a sampling of projects, such as those on the activity of an antibiotic, evaluation of a new wood preservative, studies of pesticides, isolation of a pharmacologically active material from a natural source. In one case, when the producer of a food container was interested in a special evaluation of some of the materials used in preparing his product, a biology team was assembled. They have been making toxicological tests of the container's components, also extractions to see if the materials present can be leached from the container by solvents which simulate the action of various food products. Another group is investigating the toxicity hazards of a product not directly concerned with food, but with which people frequently come in contact; the results will enable the client to select materials free from possible danger to the consumer.

FIG. 1. *A view of part of the main laboratories of Arthur D. Little, Inc. at Cambridge.*

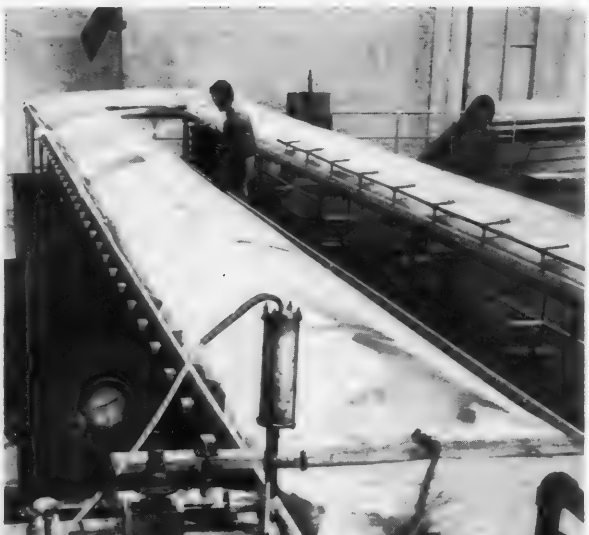


FIG. 2. *One portion of the large diameter polyethylene tubing in which large-scale cultures of* Chlorella *were grown in the pilot-plant study referred to in the text.*

To some it may seem that this sort of thing is not basic science—that it is "merely" applied biology, and in some instances they will be correct. The question is, how far from the mainstream of biology has the consulting biologist drifted? That is up to the individual. Clearly, it is wise for biologists in industrial service to keep abreast of current basic scientific developments, to attend meetings, to present papers themselves — briefly, to maintain their professional competence.

A.D.L. has a policy of granting professional employees permission to pursue investigations in basic research on subjects in which they as individuals are particularly interested. This, the internal research project, is encouraged in the belief that it is necessary in order to keep up a scientist's competence and effectiveness—not to mention his morale. The findings appear not only in appropriate scientific journals, but often in later industrial applications.

One such study was an investigation of the adsorption of enzymes and the demonstration that certain enzymes, when adsorbed, retain their activity. By various kinetic measurements it was possible to show that the enzyme—invertase from yeast was the principal one used—when adsorbed to a cation exchange resin retained its activity. Its sensitivity to substrate concentration (the Michaelis constant) was not appreciably changed by the adsorption, although there was a decrease in the resistance of the enzyme to heat activation. From this adsorption system it was possible to develop a column for the continuous catalysis of the invertase reaction, i.e. a column into which a solution of sucrose flowed with a flow of invert sugar out of the column. Aside from the obvious practical applications of such a system, there are certain implications here for the biochemist. This system could provide a model for studying the mechanism of action of enzymes in the intracellular environment, where they may well be adsorbed onto materials not so very different in nature from the ion exchange resins used and where a steady state is produced by a continuous "flow" of substrate.

Two research programs have been based on the use of *Neurospora*, the mold so widely used in biochemical genetics. In one, the antagonistic relationships between the carcinogenic azo-dyes and riboflavin in their effects on the growth of a riboflavin-dependent strain were studied. The findings on various factors of specificity in the relationship and on phenomena of resistance and adaptation may well provide clues to some of the mechanisms of drug resistance as observed in clinical situations.

As part of a collaborative study on the possible value of a number of microorganisms as screening systems in the development of new agents for the treatment of cancer, *Neurospora* was tested at the A.D.L. laboratories. Its growth responses to the 200 assorted compounds involved showed a moderate degree of correlation with the responses of experimental tumors. The similarities and differences between the organisms involved are of some interest in comparative biochemistry, as well as cancer chemotherapy.

Less Than Research, and More

Research activities are not all that occupy the consultant biologist's time. He serves as consultant to his company's other staff members as well as to their clients. His telephone rings frequently with requests from other departments for information on such subjects as the possible presence of vitamins in products where they had not been suspected before, on the possible health hazards of some witches' brew the chemists are concocting, for an opinion on the feasibility of some aspect of space travel which the engineers may be considering. At times he even functions as a teacher. When an economics group is making a market survey for a drug manufacturer, in all probability they will want to be completely and authoritatively informed on the most up-to-date pharmacology of the drug and its major competitors.

A.D.L. offers a service called the "technical audit", which assesses a company's research and technical facilities—personnel, program and future plans. As well as experts in research management, the operation requires specialists in chemistry and engineering, and, when the company under study employs biological processes, produces things used biologically, or has problems of air or stream pollution, someone on the project group represents biology.

On occasion the tables are turned and other groups in the company work on problems with a biological basis. In 1950, an A.D.L. chemical engineering group undertook a project in biotechnology for the Carnegie Institution of Washington, D. C. It was a pilot plant study of the growth of *Chlorella* to define the technical and economic factors affecting its possible use for food. It showed that the algae can be grown in large quantities but only at uneconomic expense. At that time, the economic factors hung mostly on engineering considerations, including the cost of equipment for harvesting the cells and for cooling the culture fluids. The recent discovery of temperature-tolerant strains of *Chlorella* may well lead to a process within the realm of economic feasibility.

The research equipment produced by the company provides another example. The basic concept for the A.D.L.-Cohn Blood Fractionator, which separates the cells and serum of blood by centrifugation in a continuous operation, was developed by the late Dr. E. J. Cohn of Harvard University. In consultation with him, A.D.L.'s mechanical engineers were able to devise a practical machine design. The resulting piece of equipment is now being used in laboratories throughout the world. It is one of the few specialized items which ADL, normally concerned only with research and development, manufactures for sale.

In Conclusion

The other activities of a biologist in a consulting firm are, of course, common to most staff members. He acts in adminis-

trative ways: in contract administration, personnel hiring, following up leads with prospective clients, and general public service activities. If he desires, a fair percentage of his time is spent traveling, in order to provide the personal discussion necessary to external research projects.

In conclusion, we may ask: How does the situation of a biologist in an industrial consulting company compare with that of biologists elsewhere? Like his industrial colleagues, in a drug company for instance, he may work alone or in collaboration but may be involved in an even wider spectrum of projects and cooperating talents. His responsibilities are not only scientific, but include phases of business and administrative activity. Along with opportunities to engage in professional activities of his own and to work on industrial problems in which his activities contribute all or only a part of the result, he has the opportunity and even an obligation to acquaint himself with a broad area of modern technology, in thought, practice, and informal personal contact, which he might not otherwise find so readily accessible. Not only contacts with other groups in the company, but also his own part in the functioning of the company, give him a knowledge of how science relates to technology and to life in vital and immediate ways.

Conference on Shark Repellents

A CONFERENCE on the Basic Research Approaches to the Development of Shark Repellents, sponsored by the AIBS and Tulane University, and supported by the Office of Naval Research and Navy Bureau of Aeronautics was held in New Orleans, April 8 to 11, 1958. There were 34 participants including representatives from Australia, Japan and the Union of South Africa. Dr. Fred R. Cagle acted as chairman and host.

The need for a gathering such as this reflects a growing concern for better protection against shark attacks and fatalities which occur more frequently than is generally recognized. A "shark chaser" was developed by the U. S. Naval Research Laboratory during World War II and is still being used. However, reports indicate that under certain conditions it may not be effective, and many of those who are required to depend upon this preparation for their personal safety do not have the necessary confidence in it. When first developed, this repellent was tested in a variety of ways, but these tests are not considered entirely adequate, and the degree of its effectiveness is still not clearly known.

While the aim of this Conference was to recommend the ways and means of finding a method which is more effective than the present one for the protection of airmen and Navy personnel who have been accidentally dropped into shark-infested waters, such a method could possibly have much wider application; as, for example, in protecting bathers at beaches, in diving operations, following accidents among ships and, in fact, in all situations where persons find themselves in water inhabited by sharks.

There seemed to be unanimous opinion that, if better methods for protection against shark attack are to be developed, a broad program of basic scientific research will have to be instituted. This conclusion stemmed from a series of papers which were presented by the participants on various aspects of the biology of sharks.

In the field of systematics, the Conference learned that there are about 350 kinds of sharks in the world, of which only about two dozen are considered to be dangerous, and a still smaller number are listed as regularly dangerous. However, there are several questionable species concerning which more information is urgently needed. A number of taxonomic problems also require investigation, and to this end special technical problems must be solved when, as in sharks, the whole body cannot be conveniently preserved. The need for a series of simple measurements and procedures was recognized, as was the suggestion to standardize common names, to facilitate gathering of accurate information concerning the species involved in attacks.

Closely allied to problems in systematics were ecological considerations. The distribution, activities, and movements of dangerous species of the eastern, southern, and western coasts of Africa, were compared with data from the coasts of Australia. Elsewhere, there appears to be a paucity of ecological information; and the suggestion was made that future systematic studies include detailed ecological data whenever possible.

A considerable body of information was supplied concerning the behavior of sharks. Most of these observations were interesting and highly suggestive, but they were fragmentary and, for the most part, inconclusive. The introduction of anecdotal evidence led to a sterm warning concerning the limitations of such data and a plea was made urging investigators of shark behavior to acquaint themselves with, and adopt the scientific methods developed over the years by the animal behaviorists as the most effective way of obtaining valid behavioral data.

Methods were described for the capture and transport of large sharks without harming them unduly. Also described was a large, ring-shaped tank with a continuous flow of water, in which sharks could be effectively maintained and their behavior observed. But the objection was raised that information obtained from captive individuals or harmless species could not be applied to problems concerning dangerous species in natural situations. Eventually, it was agreed by most, if not all, present that only the results of experiments and observations in both laboratory and field situations, on both harmless and dangerous species, will yield the pertinent information and ideas which, when taken together, will lead to the stated objectives.

Techniques for the study of behavior in the field were described and discussed; and several localities were described which are particularly suitable for the observation of dangerous species. Likewise, methods applicable to the study of small sharks in captivity were evaluated. Several participants noted that the feeding habits of sharks may become conditioned by the food normally present in the area, or by some special conditions in their environment. This finding was related to the observations that a given species may be much more dangerous in some areas than in others, barring, of course, the possibility of still unrecognized subspecific genetic differentiation.

Methods of conditioning sharks were described; and the need to perform ontogenetic or developmental studies, particularly on feeding, aggressive, social, and diurnal behavior, was emphasized.

Several reports indicated that sharks may at time be highly selective in their attacks. When sharks in captivity are fed live fish, occasional individuals may escape the immediate attention of the predator. Eventually the fortunate individuals are accepted as tank-mates seemingly immune to further predation. Observations such as these led to a more general discussion of predator-prey relations. It seems obvious that an understanding of the mechanism of subtle discrimination and selection which are involved would be most pertinent to the over-all problem.

Several kinds of feeding behavior and attack were described, for example, the slow determined bite, the rapid attack, the repeated strikes, and the frenzied mob attacks. These behavioral differences may be characteristic of species, but they may also reflect different environmental situations. Also emphasized is the need for motivational studies, especially investigations of the stimulus situations which lead to feeding or aggressive acts.

During the anatomy and physiology sessions, numerous comparisons were made between sharks and bony fishes particularly in their sensory and neural capacities. Con-

cerning the chemical senses, several investigators emphasized that sharks are capable of responding to extremely dilute solutions; but they are also likely to habituate, unless the quality or quantity of the chemicals change frequently. This suggested the need for the alternate use of two repellent substances. Stemming from the generalization that strong stimuli usually repel and weak ones attract, the suggestion was made that a dilute solution of a repellent might actually have the reverse action, and act as an attractant. It was noted that the present repellent may function as a coagulant of mucus, which may indirectly reduce the sensitivity of the olfactory or gustatory epithelium. The conference agreed that many more repugnant substances should be tested.

The eyes and vision of sharks were discussed in considerable detail. The group learned that sharks are likely to have a very low visual threshold for white light, no spectral sensitivity, and poor acuity. However, quantitative tests should be conducted, especially since suitable techniques for accurate measurements are now available and can probably be adapted to sharks.

The physiology of hearing and related senses was discussed at length. It was indicated that sharks could either be attracted or repelled by sounds. The conference learned that there is considerable doubt whether the ampullae of Lorenzini are sensitive to hydrostatic or temperature changes; rather, they may respond to pressures of a deforming sort.

Most of the conferrees were interested to learn of the recent evidence questioning the classical conception of the lateral-line system in teleosts as a receptive mechanism for low-frequency vibration. Rather, it may represent a hydrodynamic mechanism for the detection of turbulence, relative motion, avoidance of obstacles, and may serve to facilitate the proper bending of the body in swimming. It is still considered to function in orientation, but different factors are apparently involved.

The nervous system of sharks shows little species variability. The olfactory system is obviously dominant in all species, but the structural configuration of the brain suggests limited integration of the various sensory capacities in contrast to the elaborate integrative mechanisms found in bony fishes.

At the final session the conference framed and adopted a resolution which was signed by all of the U. S. members of the conference, noting the lack of a center for information in the field of human survival, especially as it related to protection against sharks. The resolution strongly recommends to the U. S. Secretary of Defense, the establishment in the Department of Defense of a Technical Advisory Panel on Human Survival under Isolated Emergency Situations. **Lester R. Aronson, Department of Animal Behavior, The American Museum of Natural History, New York.**

As a result of the aforementioned deliberations a committee was appointed to formulate tentative recommendations for a broad scientific program which would deal with the shark hazard problem. The committee consisted of: Lester R. Aronson, Bruce Halstead, Carl L. Hubbs, Arthur W. Martin, Leonard P. Schultz, J. L. B. Smith, Stewart Springer, Tohru Uchida, F. G. Wood, Jr., Gilbert P. Whitley, Perry A. Gilbert, Chairman. The committee, after consultation and discussion with the other members of the Conference, formulated the recommendations listed below.

Documentation

An essential task is the critical evaluation of attacks by sharks on man. This stock-taking should cover, in so far as possible, the species and size of shark involved, and the mode of attack; the time, place, and circumstances, including date, hour, sea and weather conditions, water temperature, salinity, etc.; the reactions of the person attacked, and all other data needed for as complete an epidemiological picture as can be obtained. Facilities should be provided for securing such information, by prompt dispatch of a competent person to interview the victims, witnesses, and physicians involved, and by gathering all pertinent news dispatches or other reports, photographs, etc. This documentation can best be done on a regional basis. It is recommended that the World Health Organization and other appropriate international agencies consider shark attack as a reportable disorder or cause of death and assist in the collection of reliable epidemiological information on this subject. The publication of the essential data, critically evaluated, is highly desirable. Copies of all data should be forwarded to a central repository, preferably at the Smithsonian Institution in Washington, D. C., where it would be filed for the use of the AIBS Shark Research Panel and others concerned with the shark hazard problem.

Research Procedure

1. Identification and classification.

It is essential that worldwide comparative systematic studies be undertaken so that we may readily, precisely, and consistently, identify the sharks that attack man. The studies should be of sufficient scope and validity to assure a reasonably stable nomenclature. Such studies will require the service of competent systematists, with provision for preserving and shipping specimens and for studies at various museums and in the field.

Uniform criteria for sampling, measuring, and photographing sharks should be drawn up by ichthyologists to insure comparable data, and a simplified set of instructions should be approved for use by non-specialists.

2. Analysis of behavior.

Relatively little is known about the behavior of sharks. It is necessary, therefore, to amass information derived from observation and experimentation, in the laboratory and in the field, on all phases of shark behavior with particular emphasis on those species considered dangerous to man.

Especially pertinent are the ecological conditions, specific stimuli, and the developmental and organic factors, which lead to feeding behavior and other aggressive actions. The movements of sharks over long distances, their social structures, and their methods of orientation and discrimination merit special consideration.

3. Structure and function.

Considerable attention should be directed to increasing our knowledge of the basic anatomy and physiology of sharks. Analysis of the structure and function of those organs which have a directive influence, either directly or indirectly, in guiding a shark to its target, or which respond to countermeasures, should be emphasized.

4. Consideration of deterrents.

This involves a consideration of physical, chemical, and biological agents, leading to the development of an effective shark repellent, which at the same time would be harmless to the user.

Attention should also be given to man's behavior in the water in the presence of sharks, i.e., to those movements which might serve to attract or repel sharks, with a view to recommending a behavior pattern for man which would increase his chance of survival, with or without a repellent in shark infested waters.

5. Design of good testing procedures.

Rigorous tests of repellents should be carried out under both laboratory and field conditions, especially on sharks known to be dangerous to man. It is suggested that repellents be first tested against the strongest possible lure, such as fresh blood or fish known to be readily devoured by sharks. Testing methods should be standardized as soon as possible so that they may be easily repeated and evaluated by trained observers in different parts of the world.

6. Evaluation.

Materials and techniques should be evaluated under rigorous operational conditions.

Analysis and Dissemination of Information

It is recommended that well analyzed information for the layman concerning dangerous sharks and shark problems be rapidly and widely disseminated through the publication of an illustrated handbook for military and civilian agencies and the general public. The prompt preparation of training and educational aids such as films, instructional manuals, and technical and first aid bulletins, is also recommended.

Implementation

The importance and urgency of the problem of shark hazard calls for adequate and prompt action. The Conference makes

the following specific recommendations:

1. An international ad hoc shark research steering committee should be maintained under the sponsorship of the AIBS Hydrobiology Committee to serve as a means for the exchange and collation of technical information as well as research activities.

2. Adequate support should be provided for both basic and applied research, with due emphasis on the most urgent aspects of the problem. It is highly desirable that some funds be made available for special emergency needs.

3. Research should be encouraged and supported at various established institutions, at temporary field stations, and on mobile units.

4. Individual investigators with promising projects of both applied and basic nature should be encouraged and supported.

5. Research should be encouraged abroad as well as in American waters, and all such work should be coordinated. It is recommended that foreign investigators be given financial support for research on important phases of the shark program. **Perry A. Gilbert, Cornell University, Ithaca, N. Y.**

Naturalists, Campers, and Related Small Fry—Welcome to Old Indiana

FRANK N. YOUNG, *Indiana University*

THE coming AIBS meetings in Bloomington, on August 25 thru 28, will afford many biologists a pleasant opportunity to see Indiana at its best. By late August the hot, muggy "corn weather" is past, and there is a touch of fall in the air to give zest to outdoor activities. The main purpose of the meetings is, of course, to provide opportunities for the communication of biological information, but those who like the out-of-doors will find outdoor Indiana an added, and inexpensive, treat. The scenery is not as completely composed of cornfields as you may expect.

The various participating societies have planned an abundance of field junkets in connection with the meetings. There are trips and hikes to suit almost every taste. These will range from sedate early morning bird strolls to harrowing cave explorations arranged by the local "spelunkers." Bring your old clothes and enjoy some of these activities with us.

The main trips have been described in the publications of the various societies, and are listed in the A.I.B.S. Bulletin. Most of these are open to registrants at the convention whether they are members of the society concerned or not. The staffs of the various biological departments and their students on the Indiana University campus will also be happy to provide information on local collecting places and other worthwhile activities. We cannot guarantee personally conducted tours to every specialist, but we will do our best as long as we and our students last.

Those who like camping will like Indiana. Almost any road map will show the location of the many fine state parks. Each of these is equipped with facilities for picnics, restrooms and shelters, tested water, and refreshment stands. Areas for individual and group camping are also adequate in most, and more elegant hotel and cabin facilities are available at a price. Requests for reservations for group camping, hotel rooms, or cabins must be made directly to the superintendents of the parks concerned. Individual campsites are available to all—first come, first served—at very nominal fees. Saturdays, Sundays, and holidays are, of course, also the days when the Hoosiers come out of their warrens to infest their parks, so plan your visits accordingly.

The outstanding parks in the state from a naturalist's point of view are the Indiana Dunes, Turkey Run, The Shades, McCormick's Creek, Clifty Falls, Muscatatuck, and Spring Mill. All of these present excellent out-door facilities plus beautiful scenery. In addition, Shakamak, Tippecanoe River, Versailles, Brown County, and the Mounds state parks, although of lesser interest from a natural history viewpoint, are excellent stopping places.

The Indiana Dunes State Park is in northern Indiana between Porter and Michigan City. It is easily reached from the Dunes Highway (U. S. Hgw. 12). This 2,220 acre area is about the only piece of the Lake Michigan dunes left intact in Indiana. The parts farther west where early studies on plant succession were carried out are now largely absorbed by the industrial areas of East Chicago and Gary. One can still reach Pine, Indiana, which appears on so many old collecting labels, by turning north on Clark Street in Gary. The rolling mills now occupying this site are interesting, but casual collectors and naturalists are not encouraged to enter. At the park, there are campsites, lake shore swimming, and carefully planned nature trails. As in other state parks indiscriminate collecting of plants and animals is discouraged; but the superintendents are reasonable people, and if one explains his specific needs they are usually tractable, or at least able to point out nearby areas where collecting may be done.

South of Michigan City on U. S. Hwg. 421, the Jasper-Pulaski State Game Reserve will be of interest to the ornithologists. Here, the sand-hill crane pass in the spring and fall, and there is an abundance of other marsh birds all year round.

Farther south, about 7 miles west of U.S. Hgw. 421 on Ind. Hgw. 114, are a few remnants of the old Francesville Prairie in Jasper County. Ungrazed relicts of the prairie still persist along the railroad right-of-way, and on the Ready Ranch near here are perhaps the last "booming grounds" of the prairie chicken in Indiana. Unfortunately, the booming season is past in August.

To the east along U.S. Hgw. 35 are Bass Lake and Tippecanoe state parks. Both offer camping facilities, and the latter which comprises 6,000 acres of land includes an eight mile stretch of the Tippecanoe River still in fairly natural condition.

Those who enter Indiana by way of the turnpikes from the east will find Pokagon State Park on Lake James convenient. The park maintains a wildlife exhibit in which buffalo, elk, deer and other native animals may be observed. In addition to its natural attractions this park offers horseback riding, swimming, boating, and golf on nearby links. The Potawatomi Inn is one of the largest and most attractive of the park hotels.

Mounds State Park near Anderson maintains picnic and other recreational facilities along the bluffs of the White River, but the park's main attraction is the group of mounds built by the prehistoric "Mound Builders."

Northwest of Indianapolis near Crawfordsville are Turkey Run and The Shades state parks along the scenic gorges of Sugar Creek. Turkey Run includes two hundred and eighty five acres of virgin mixed broadleaf forest. This was protected for many years by an eccentric who just didn't like to see trees cut down. The state now substitutes for his shotgun. Other notable natural features of these two parks are the stands of hemlock, white pine, and yew which occur here as relicts outside their normal ranges. "The heavy timber growth and the cool canyons decorated with lacelike ferns, moss and vines, provide a never ending thrill to the nature lover and hiker," says the Indiana Department of Conservation. Turkey Run Inn provides a modern

hotel and dining room for those who do not want to camp out.

The Pine Hills area north of The Shades State Park on Ind. Hgw. 234 will be visited on one of the field trips starting from Bloomington. This area is of particular natural interest because of the diversity of plant and animal habitats included. There are, however, no camping or hotel facilities now available.

Those approaching Bloomington from the west will find good camping facilities and interesting scenery at Shakamak State Park near Jasonville. Those coming from the southwest will probably want to stop at New Harmony, the site of the Owen-McClure experiments in education, destination of the "boatload of knowledge," and one time residence of the naturalist Thomas Say. The local "museum" at New Harmony may contain some real treasures, although no one is apt to find them on casual examination. A side trip to Hovey Lake with its beautiful cypresses would also be worthwhile for the botanist or ornithologist.

Those approaching from the southeast will find several excellent parks with camping facilities. Versailles State Park (ask for Vur-sails) is accessible to the beautiful scenic drives along Laughery Creek and other streams which have cut their channels to base level with the Ohio. Clifty Falls State Park preserves a portion of the bluffs along the Ohio River where the visitor may wander along trails through scenery similar to that which must have greeted the early explorers. Clifty Inn is an excellent hotel. Muscatatuck State Park near North Vernon, also provides hotel and cabin facilities for the visitor.

Three state parks are within easy driving distance of Bloomington. All three provide facilities for camping as well as excellent hotels.

The largest is Brown County State Park in the heart of the beautiful Brown County hills. The Abe Martin Lodge provides rooms and meals and a group of pleasant cottages are available serviced from the lodge. An excellent swimming pool, saddle horses, recreation areas, and nature trails are among the other attractions.

McCormick's Creek State Park west of Bloomington provides an excellent hotel and dining room. The natural features include the canyon of the creek cut by waters from the large glacial lakes which were once impounded to the south. There are also good stands of beech-maple and mixed forest and scenic stretches along the White River.

Spring Mill State Park, the third of the three easily reached from Bloomington, also provides an excellent hotel and dining room as well as cabins. The natural features include a stand of virgin forest which contains many very large white oaks and tulip trees. This will be visited on one of the field trips originating from Bloomington during the meetings. Another outstanding natural feature is the extensive cavern system where blind fish (*Amblyopsis*), white crayfish, and other cave organisms can be observed. The park also includes a reconstructed pioneer village centered around a large, water-powered stone grist mill.

In addition to the state parks, the area around Bloomington provides many natural areas only a short drive from the place of the meetings. Since the region is rough, unglaciated land, the visitor will find more scenery and less corn that in most parts of the midwest. Some of the types of natural habitats available to collectors, are: Relict beech-maple stands on the campus, prairie fragments a few miles to the west around Worthington, hemlock stands on sandstone bluffs near Freeman and in Brown County near the state park, oak-hickory and other forest types, a small relict sphagnum bog near Handy, and numerous caves supporting subterranean animal communities. Members of the local "spelunking" club have offered to guide visitors to and through some of the more interesting caves in the vicinity.

Outdoor Indiana offers as innocuous environment as one can find anywhere. Rattlesnakes and copperheads are practically extinct, and poison ivy is readily recognized by August. Mosquitoes and biting insects are practically never troublesome. If you have never camped out but want to try it sometime, this August in Indiana is the ideal time to start.

Nature Preserves Recently Established by The Nature Conservancy

RICHARD H. GOODWIN, *Connecticut College, New London, Conn.*

THE purpose of this article is to bring to the attention of the scientific public the establishment of a series of nature preserves as an early unfolding of a broad natural area preservation program now being developed by the Nature Conservancy.

Thoughtful people are becoming increasingly concerned over the rapid changes being wrought upon the face of the land by an aggressive expanding population. Remnants of original forest are being destroyed, the last sections of tall-grass prairie are disappearing before the plow, swamps and marshes are being drained or filled, bogs mined for peat, streams dammed or polluted, sand-dunes and lake shores crowded with cottages. For the biologist these changes mean the extirpation of rare and interesting species, the disappearance of biotic communities, which are sometimes the subject of continuing ecological studies, and the loss of favorite sites for field trips or for sources of experimental material. An action program for the preservation of these threatened and vanishing habitats is, therefore, a matter of great urgency.

The Nature Conservancy is a national membership organization dedicated to the preservation of all types of wild nature. An outgrowth of the Ecological Society of America, it was organized in 1946 as the Ecologists Union. In 1951 it was incorporated in the District of Columbia under the name of the Nature Conservancy. Its program has been focused upon the establishment on a permanent basis of natural areas or wild preserves. A major purpose in preserving these areas is to provide a basic resource for education and scientific research.

The program has been gathering momentum during recent years. At the present time fifteen tracts of land totalling about 1,550 acres are owned or are under purchase contract by this organization. These areas are listed in Table I, together with data on their acreage and ecological features. Additional preserves not owned by the Conservancy but which have been helped by the program of the organization are given in Table II. Further information about any of these areas, including names and addresses of the local custodians, may be obtained by writing to the national headquarters of the Nature Conservancy, 4200 22nd Street, Northeast, Washington 18, D. C. Research and educational programs are already underway on a number of these preserves, indicated in the tables. Appropriate use of these areas by scientists and educators within the framework of the rules set up for their maintenance is invited.

Suggestions and information concerning areas and habitat types needing preservation, will be welcomed by the officers and staff of the Conservancy. The Nature Conservancy now has chapters or affiliated action groups in the following states: Maine, Connecticut, New York, Maryland, Michigan, Illinois and Missouri. A western office has been opened at 1711 Grove Street, Berkeley, California. It is hoped the movement will soon spread to the other states, some of which already have a Conservancy representative, and that the acquisition of preserves will be greatly accelerated.

TABLE I

Preserves now owned by the Nature Conservancy or under purchase contract.

Name and Location	Year Established	Present Acreage	Type of Habitat and Special Features
Frederic C. Walcott Memorial Preserve, Litchfield County, Conn.	1957	198[a]	Black spruce bog and 12-acre Beckley Pond surrounded by forest of northern hardwoods, pine and hemlock
Mianus River Gorge, Weschester County, N. Y.	1955	161[b, e]	Mature hemlock stand and old-growth hardwoods in deep ravine [1]
Arthur W. Butler Memorial Sanctuary, Westchester Co., N. Y.	1954	250[c, f]	Swamp, stream, meadow and upland hardwood forest on rocky ridge
Smoky Hollow Bog, Fire Island Long Island, N. Y.	1956	1[c]	Bog in interdunal depression
Wolf Swamp Sanctuary, Southampton, L.I., N. Y.	1957	20[c]	Deciduous forest and marshy shore big fresh pond (Lake Missapaque)
Kings Point Pond, Great Neck, Long Island, N. Y.	1957	15[c]	Fresh-water pond, an important shelter for waterfowl in migration
Dome Island, Lake George, N.Y.	1957	16[d, g]	Mature forest of mixed hardwoods and conifers on glacial drumlin
Moss Lake, Allegany Co., N. Y.	1958	75[a]	Kettle lake and bog heath surrounded by hemlock and hardwood forest
Tannersville Bog Preserve Monroe Co., Pa.	1956	63[a]	Low-altitude spruce bog just north of the terminal morraine
Woodbourne Forest & Wildlife Sanctuary, Susquehanna Co., Pa.	1956	478[c]	Old-growth hemlock and hardwood forest (200 acres), swamp, bog pond, second growth forest, conifer plantation, and meadows.
Hellen Creek Hemlock Preserve, Calvert Co., Md.	1956	21[a]	Mature hemlock stand on tidewater. Beech, oak and Virginia pine also on the property
Battle Creek Cypress Swamp, Calvert Co., Md.	1956	100[a]	Northernmost stand of bald cypress on the western shore of Chesapeake Bay
Volo Bog, Lake Co., Ill.	[d]	47	Tamarack bog surrounding small bog lake
Wauconda Bog, Lake Co., Ill.	[d]	67	Mature tamarack bog
Holly Preserve, Stoddard Co., Mo.	[d]	40	Native stand of *Ilex opaca*.

[a] Acquired by purchase
[b] Acquired by gift and purchase
[c] Acquired by gift
[d] Under option or purchase contract. Funds now being raised.
[e] Contributions to Endowment maintenance fund now being solicited
[f] Endowment maintenance fund gift of original donor
[g] Endowment maintenance fund raised by contributions
[i] Biological inventory now in progress

TABLE II

Preserves in which the Nature Conservancy has an interest or which it has helped to establish.

Name and Location	Present Ownership	Acreage	Type of Habitat
Mamacoke Island, Waterford, Conn.	Connecticut College[a]	41	Rocky deciduous woodland and salt marsh[d]
William L. Hutchison Memorial Forest Somerset Co., N. J.	Rutgers University[a]	135	65-acre remnant of pre-colonial hardwood forest (Mettlers Woods) and buffer area[d]
Corkscrew Swamp[b], Collier Co., Fla.	National Audubon Soc.[c]	5760	Sawgrass marsh, virgin cypress forest, pond apple "runs" and surrounding pine woods
Sunken Forest Preserve[b], Fire Island Long Island, N. Y.	Sunken Forest Preserve, Inc.	61	Bay-to-beach segment of Fire Island one-half mile long, including beach, sand dunes and mature barrier-beach forest of holly, oak and pine
Tucker Prairie[b], Callaway Co., Mo.	University of Missouri	160	Tall-grass prairie[d]
Bergen Swamp[c], Genesee Co., N. Y.	Bergen Swamp Preservation Society	ca. 900	Extensive open marl beds, white cedar swamp and surrounding forest of conifers and hardwoods[f]

[a] Reverter clause to the Nature Conservancy in the deed of gift.
[b] Funds solicited for the project by the Nature Conservancy.
[c] Gift for land purchase made through the Nature Conservancy.
[d] Ecological research in progress.
[e] Active educational program in charge of resident warden.
[f] Lists of plants have been published.

This year it's Indiana . . .

INDIANA UNIVERSITY, BLOOMINGTON

August 24-28 **August 24-28**

Page 31. Housing information and advanced registration form.

Across the Editor's Desk

• **Twenty-six leading educational and research institutions have formed an inter-university corporation to be known as Associated Midwest Universities.** The announcement was made by Dr. James H. Jensen, provost, Iowa State College, Ames, the initial president of the new organization. It is planned to establish headquarters at the Argonne National Laboratory's main site near Lemont, Ill. The new corporation has been formed to: 1) promote, encourage and conduct research and education in all branches of science, including but not limited to nuclear science in relation to all other fields of science; 2) establish means for facilitating the use of the Argonne National Laboratory and other laboratories by duly-qualified personnel and students from the several cooperating institutions and other research and educational institutions; 3) establish, maintain and operate laboratories and other facilities as necessary for research and education. The initial members of the Associated Midwest Universities are: Battelle Memorial Institute, Columbus, Ohio; Carnegie Institute of Technology, Pittsburgh, Pa.; Case Institute of Technology, Cleveland, Ohio; Illinois Institute of Technology, Technology Center, Chicago, Ill.; Iowa State Colleges, Ames, Iowa; Kansas State College, Manhattan, Kansas; Loyola University, Chicago, Ill.; Marquette University, Milwaukee, Wis.; Mayo Foundation, Rochester, Minn.; Michigan State University, East Lansing, Mich.; Northwestern University, Evanston and Chicago, Ill.; Oklahoma State University, Stillwater, Okla.; Purdue University, Lafayette, Ind.; St. Louis University, St. Louis, Mo.; State University of Iowa, Iowa City, Iowa; Washington University, St. Louis, Mo.; Wayne University, Detroit, Mich.; Western Reserve University, Cleveland, Ohio.; University of Chicago, Chicago, Ill.; University of Cincinnati, Cincinnati, Ohio; University of Illinois, Urbana and Chicago, Ill.; University of Kansas, Lawrence, Kan.; University of Michigan, Ann Arbor, Mich.; University of Minnesota, Minneapolis, Minn.; University of Missouri, Columbia and Rolla, Mo.; University of Notre Dame, Notre Dame, Ind.

• **A major addition to facilities for biological research at the California Institute of Technology has been assured by a gift of $350,000 from Dr. Gordon A. Alles of Pasadena.** The gift will finance in large part a five-story building that is needed for rapidly expanding research and teaching in virology, biochemistry, biophysics, immunology and psychobiology. The new building, forming a link between the present Kerckhoff and Church laboratories, will be located near the northwest corner of the campus. It will be known as "The Gordon A. Alles Laboratory For Molecular Biology." The total cost of the building is estimated at $900,000, of which $391,500 has been pledged by the U. S. Public Health Service.

• **The National Library of Medicine has announced the publication of the 1958 volume of *Bibliography of Medical Reviews.*** The *Bibliography* is arranged by subject with a separate author index and contains approximately 2,900 references to review articles in clinical and experimental medicine and allied fields which have appeared largely in 1957. Copies of this volume may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at a price presently estimated at $1.25.

• **Research grants and fellowships** totaling $5,725,219 were awarded during the month of April by the **National Institutes of Health,** Bethesda, Maryland.

• **The organization of the George Sarton Memorial Foundation, Inc.,** a nonprofit corporation whose purpose is to promote the efforts of the late Dr. George Sarton in the history and philosophy of science, has been announced. The initial object of the Foundation is to aid in maintaining the publication of *Isis,* the international journal for the history of science founded by George Sarton in 1913, and to provide lectureships and fellowships to advance the study of the history of science. The President of the new Foundation is Chauncey D. Leake, Ohio State University. May Sarton, novelist daughter of Dr. Sarton, is Vice-President; Morton Pepper, New York City, Secretary; and William D. Stahlman, M.I.T., Treasurer. The Foundation will welcome contributions to promote its purposes in maintaining a balanced culture and to promote the high intellect and ethical standards fostered by the late George Sarton.

• Two recent publications of the National Science Foundation are: 1) **"Directory of Independent Commercial Laboratories Performing Research and Development, 1957."** This directory lists 565 laboratories, together with names of senior officers, numbers of research staff and types of research activities. Copies may be purchased for 40 cents from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. 2) **"Government-University Relationships in Scientific Research and Development"** is a report calling for increased Federal support of basic research at colleges and universities. It makes six recommendations to further this aim. Copies may be purchased from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., for 40 cents.

• **The Twenty-seventh Symposia on Quantitative Biology of the Biological Laboratory, Cold Spring Harbor,** New York, was held June 3 to 11, 1958, on the subject of "Exchange of Genetic Material, Mechanisms and Consequences." Areas discussed included replication and recombination of genetic material, recombination of genetic material (two sections), studies of crossing over and segregation, recombination and gene interaction, recombination within populations, recombination and breeding systems, recombination and gene stability. This year's symposium was sponsored by the Carnegie Corporation of New York, the Rockefeller Foundation, National Science Foundation, U. S. Atomic Energy Commission and U. S. Public Health Service. Further information may be obtained by writing directly to the Laboratory.

• **The Fourth Annual Symposium of the Institute of Microbiology,** Rutgers University, was held June 5, 1958, on the subject, "Microbiology—Yesterday and Today." The Symposium honored Dr. Selman A. Waksman, Institute Director, on the occasion of his seventieth birthday.

• **The American Institute of Physics has surpassed its goal of $500,000** to provide funds for expanded scientific publications, educational and public information activities and its new headquarters building.

• **The Seventeenth Growth Symposium** was held June 9 to 11 at Mount Holyoke College, South Hadley, Mass. The theme of this year's Annual Symposium was "Differentiation and Growth in Response to a Changing Chemical Environment." Specialists from England and Germany spoke, along with representatives of universities and research centers in the U.S.A. The conference was supported in large part by a grant from the National Science Foundation.

• **The 1958 Purdue University Industrial Microbiological Institute** was held June 2 to 7. The Institute was designed primarily as a service to those industries dealing with biological products. In addition, it serves as a refresher course in mycology to students and teachers as well as to industrial and institutional personnel. For the first time, this year, registrants could secure one hour of university credit for satisfactory completion of the one-week intensive institute. Further information regarding the Institute may be obtained from Professor C. L. Porter, Coulter Hall, Purdue University, Lafayette, Ind.

• **The 32nd Annual Priestley Lectures at the Pennsylvania State University were presented during March by Harold H. Strain,** Argonne National Laboratory, on "Chloroplast Pigments and Chromatographic Analysis." This annual lecture series is jointly sponsored by Mu Chapter of Phi Lambda Upsilon and Pennsylvania State University as a memorial to Joseph Priestley. As in the past the collected lecture notes are available from Mu Chapter.

• **The Biology Department of the University of Louisville** is now offering work leading to the Ph.D. degree. Emphasis is being given to areas relating to aquatic biology and to radiation biology.

• **The need for up-to-date coverage of the literature dealing with plant chromosome numbers has led to an undertaking designed to compile and publish in annual installments a Chromosome Index for the entire plant kingdom.** This is being done by a group of botanists who are reviewing some two hundred journals and are listing all original chromosome counts occurring therein, except those resulting from endopolyploidy or deviating because of experimental treatment.

The Index, compiled from the journals of a single year, will be published annually within the shortest possible time after the last issue of each journal is available. In addition, there is planned a supplement containing counts published in previous years, but hitherto not indexed. Each issue of the Index will contain a complete bibliography for the counts included in that number.

The first issue, in part supported by a grant from the University Research Council of the University of North Carolina, will be ready for distribution in May, 1958. It will cover the 1956 journals, from which over 2,000 listings have been taken. The price is $1.00. Advance orders would be helpful in determining the number of copies to print. Orders must be accompanied by payment and may be sent to C. Ritchie Bell, Department of Botany, University of North Carolina, Chapel Hill, North Carolina. Further information can be obtained from Marion S. Cave, Research Associate, Department of Botany, University of California, Berkeley 4, California.

• **The University of Rhode Island is accepting applications for admission in September, 1958, to the fifth entering class in the graduate curriculum in biological oceanography.** Candidates for the degree of Master of Science in Biological Oceanography spend their first year in formal course work on University campus and at the Narragansett Marine Laboratory, and the second year in the preparation of a thesis embodying original research. This may be done at the Laboratory or, by special arrangement, at nearby oceanographic laboratories and institutions cooperating in this program. In each instance the student receives individual guidance from an authority in his chosen subject. A program leading to the Ph.D. in Biological Oceanography is being formulated for September, 1959. The program is under the general supervision of Charles J. Fish, and applications should be addressed to the Director of Graduate Studies, University of Rhode Island, Kingston, R. I. Candidates for this curriculum may also apply for graduate assistantships, of which a limited number are available at the rate of $1,500 per year.

• **Announcement has been made of the consolidation of the Applied Research Laboratories, Glendale, California, with Bausch and Lomb Optical Company, Rochester, New York.** ARL has developed many products in the industrial analytical control field, employing radiation measurements. These promising new areas, heretofore unexplored by Bausch and Lomb, will serve to broaden its participation in the field of analytical control instrumentation.

• **The fifth annual Symposium on Systematics will be held at the Missouri Botanical Garden, October 24 and 25, 1958.** The subject of this year's symposium will be "Taxonomic Consequences of Man's Activities." The symposium will be led by Edgar Anderson and Robert L. Usinger. Five invited papers on different aspects of the problem as it relates to botanical and zoological systematics will be given by F. R. Fosberg, Robert R. Miller, H. H. Ross, Jonathan Sauer and G. Ledyard Stebbins. The symposium is aided by a grant from the National Science Foundation. Further information may be obtained from Dr. George B. Van Schaack, Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis 10, Missouri.

• The AAAS in cooperation with UNESCO and the Special Committee on Oceanic Research of the International Council of Scientific Unions has organized an **International Oceanographic Congress** to be held from August 30 to September 12, 1959, at the United Nations Building, New York. It will be devoted to the fundamentals of the marine sciences rather than to their applications. It is hoped that it will provide a common meeting ground for all sciences concerned with the oceans and the organisms in them. The Congress will be centered around the following five symposia. 1) "The history": discussions of the shape and structure of the ocean basins, the acting forces and processes, the origin of sea water and marine organisms, the stratigraphy of the deep sea, and the climatic record. 2) "The boundaries": discussions of the coupling of sea and air, sea level, epicontinential sediments, estuarine and near-shore circulation (including the estuarine environment), influence of land masses on the behavior and distribution of marine organisms, and surface films and their importance in exchange processes. 3) "The deep sea": discussions of the geochemistry and physics of circulation, stirring and mixing in the ocean, nature and origin of bathypelagic life, distribution of pelagic sediment types (biological and physical interpretations), nuclear processes in pelagic sediments, and special characteristics of abyssal organisms. 4) "Dynamics of organic and inorganic substances": discussions of physical chemistry of sea water, biologically active substances in sea water, primary production, balance between living and dead organic matter in the oceans, exchanges between sea and air, exchanges between sediments and sea water, and vertical transport in the ocean. 5) "The marine life regime": discussions of the paleogeography of marine floras and faunas, biogeographical regions in the sea, evolution and adaptation in the sea, behavior of marine organisms as influenced by environmental factors, physiology of marine plants, and culture of marine organisms as a means of understanding environmental influence on population. Titles and abstracts of papers submitted for possible selection should be submitted no later than *February 1, 1959*. Completed papers should be submitted by *May 1, 1959*. All papers must be accompanied by an abstract in a second language of the congress. Papers may be presented in English, French, German, Russian or Spanish. Simultaneous translations will be available for at least some of these languages. Titles and abstracts of papers and any other correspondence should be addressed to Dr. Mary Sears, Chairman, Woods Hole Oceanographic Institution, Woods Hole, Mass.

• **The American Association of University Women announces 40 fellowships open to women in 1959-60.** They are offered to 1) women who already hold the doctorate, 2) women who have completed all requirements for the doctorate except the dissertation. These fellowships are unrestricted as to field and place of study except that one is specified as postdoctoral in the field of Physics, Chemistry, or Biology. The stipends range from $2000 to $4000. Application forms may be obtained from the Director, AAUW Fellowship Program, 1634 Eye St., N.W., Washington 6, D. C. The application deadline is December 1, 1958, and successful candidates will be notified by March 1, 1959.

• **Brandeis University has announced the establishment of twenty fellowships** made possible through a grant from the National Institutes of Health to cover the cost of tuition, room and board **at the Institute of Photobiology,** which will be held in Waltham, Mass., June 23 to August 1. Further information may be obtained by writing to Brandeis University, Photobiology Institute, Waltham, Mass.

• **The *IGY Bulletin,*** official publication of the U. S. National Committee for the International Geophysical Year, is now available by subscription. The subscription rate is $4.00. This will include all back issues, dating from July, 1957, together with all future issues. Subscriptions should be sent to the Publications Office, National Academy of Sciences, 2101 Constitution Avenue, Washington 25, D. C.

• **The Rockefeller Institute for Medical Research and the Office of Naval Research are jointly sponsoring the position of Jacques Loeb Associate in Marine Biology** at the Rockefeller Institute in New York and in its laboratory at

the Marine Biological Laboratory, Woods Hole. Appointment will be for a one-year period, beginning on or about September 1, 1958. The purpose is to encourage the interest and increase the competence in marine biology of an outstanding teacher in marine biology, preferably in a liberal arts college, so that he may return to further the interests of his students in the field. Applicants should have a Ph.D. degree, at least several years teaching experience, preferably be between 30 and 40 years of age and on leave of absence from his college of university. The stipend will be equivalent to his regular salary and employee benefits with an additional allowance to cover extra costs incurred in moving, additional rent, etc. Applications for the position should be addressed to Detlev W. Bronk, President, Rockefeller Institute, New York 21, N. Y.

• **The formation of the Japan Information Center of Science and Technology has been announced.** A semi-official organization, it will be supported both by government and private funds and will form a central documentation center for science and technology. It will have its headquarters in Tokyo.

• **The following persons are members of the President's Committee on Scientists and Engineers:** *Howard L. Bevis* (Chairman), President Emeritus, Ohio State University; *Arthur S. Adams*, President, American Council on Education; *Joseph W. Barker*, President, Engineers Joint Council; *Glenn O. Blough*, President, National Science Teachers Association; *Detlev W. Bronk*, President, National Academy of Sciences; *Frederick Burkhardt*, President, American Council of Learned Societies; *J. Ollie Edmunds*, President, Association of American Colleges; *Fred Eggan*, Chairman of the Board, Social Science Research Council; *Edgar Fuller*, Executive Secretary, Council of Chief State School Officers; *Lyman V. Ginger*, President, National Education Association; *Eric A. Walker* (Vice Chairman), President, Pennsylvania State University; *M. T. Harrington*, President, American Association of Land-Grant Colleges and State Universities; Mayor *John B. Hynes*, Boston, President, U. S. Conference of Mayors; *F. C. Lindvall*, President, American Society for Engineering Education; *George Meany*, President, American Federation of Labor-Congress of Industrial Organizations; *R. B. Norman*, President, National Association of Secondary-School Principals; *Laurence Snyder*, President, American Association for the Advancement of Science; Governor *William G. Stratton*, Illinois, Chairman, Governors' Conference Council of State Governments; *Ernest G. Swigert*, President, National Association of Manufacturers; *P. M. Talbott*, President, Chamber of Commerce of the United States. The Executive Director of the Committee is Robert L. Clark; Staff Director, Eugene D. Vinogradoff.

• **The President's Science Advisory Committee** contains the following members and consultants (M.-member; C.-consultant): *Robert F. Bacher*, California Institute of Technology (M-Physics); *William O. Baker*, Bell Telephone Laboratories (M-Phys. Chem.); *David Z. Beckler*, Executive Officer of Science Advisory Committee (Chem. Eng.); *Lloyd V. Berkner*, President, Associated Universities, Inc. (M-Physics); *Hans A. Bethe*, Cornel University (M-Theoretical Physics); *Detlev W. Bronk*, Rockefeller Institute for Medical Sciences (M-Phys., Biophysics); *James H. Doolittle*, Shell Oil Company (M); *Hugh L. Dryden*, Director, National Advisory Committee for Aeronautics (C-Physics); *James B. Fisk*, Bell Telephone Laboratories (M-Physics); *Caryl P. Haskins*, Carnegie Inst. of Washington (M-Phys., Genetics); *Albert G. Hill*, Weapons Systems Evaluation Group (C-Physics); *James R. Killian, Jr.*, Special Assistant to the President for Science and Technology (Chairman); *George B. Kistiakowsky*, Harvard University (M-Physical Chem.); *Edwin H. Land*, Polaroid Corporation (M-Physics); *Emanuel R. Piore*, I. B. M. (C-Physics); *Edward M. Purcell*, Harvard University (M-Physics); *Isidor I. Rabi*, Columbia University (M-Physics); *H. P. Robertson*, California Institute of Technology (M-Physics); *Herbert Scoville, Jr.* (M-Phys. Chem.); *Alan T. Waterman*, National Science Foundation (C-Physics); *Jerome B. Wiesner*, Research Laboratory of Electronics, M. I. T. (M-Physics); *Herbert York*, Livermore Laboratory (M-Physics); *Jerrold R. Zacharias*, M. I. T. (M-Physics).

• **The Massachusetts State Teachers College at Bridgewater recently established an undergraduate major in biology.** Students enrolled in the program are required to take work in general education, professional education, chemistry, geology, mathematics, physics, general botany, general zoology, invertebrate zoology, vertebrate zoology, plant physiology, animal physiology, microbiology, genetics, plant taxonomy and field biology. The staff consists of Frank J. Hilferty, Chairman; William J. Wall, Jr.; Kenneth J. Howe; Elizabeth M. Cirino; and E. Irene Graves.

• **Future International Congresses of interest to biologists:**

July 4-6, 1958. Brussels, Belgium. International Colloquium on Speleology. Le Secretaire General du Colloquium International de Speleologie, Mr. Stephane Paumen, 183, Avenue Nouvelle, Brussels.

July 6-12, 1958. London, England. 7th International Cancer Congress, International Union Against Cancer. Dr. Harold F. Dorn, Secretary General, Union Internationale Contre Le Cancer, National Institutes of Health, Bethesda 14, Maryland.

July 9-15, 1958. London, England. Symposium on Zoological Nomenclature, International Trust for Zoological Nomenclature. Mr. Francis Heming, 28, Park Village East, Regent's Park, London, N. W. 1.

July 10-14, 1958. Harpenden, Hertfordshire, England. Colloquium on Methods of Research in Soil Zoology, International Group for the Study of the Fauna of the Soil. Dr. Paul W. Murphy, Rothamsted Experimental Station, Harpenden, Hertfordshire, England.

July 10-14, 1958. London, England. International Union of Biological Sciences, 13th General Assembly. Chairman, Division of Biology and Agriculture, National Research Council, 2101 Constitution Avenue, N.W., Washington 25, D. C.

July 15, 1958. London, England. The Linnean Society, Special Meeting to celebrate the 200th anniversary of the publication of the 10th edition of the "Systema Naturae" of Linnaeus and the centenary of the joint communication made to the society by Darwin and Wallace on evolution by natural selection. The Linnean Society of London, Burlington House, Piccadilly, London, W. 1.

July 16-23, 1958. London, England. 15th International Congress of Zoology. The Registrar, c/o British Museum (Natural History), Cromwell Road, London, S. W. 7, England.

August 4-9, 1958. Stockholm, Sweden. 7th International Congress of Microbiology. Mr. F. C. Harwood, Business Manager, Society of American Bacteriologists, Waverly Press, Inc., Mt. Royal and Guilford Avenues, Baltimore 2, Maryland.

August 10-16. Burlington, Vermont. International Congress of Radiation Research, National Academy of Sciences-National Research Council and the Radiation Research Institute. Dr. John S. Coleman, Executive Secretary, Division of Physical Sciences, National Academy of Sciences-National Research Council, 2101 Constitution Avenue, Washington 25, D. C.

August 13-20, 1958. Prague and Smolenica, Czechoslovakia. 1st International Conference for Insect Pathology and Biological Control. Dr. Jaroslav Weiser, Institute of Biology, Praha XIX, Na cvicisti 2, Czechoslovakia.

August 20-27, 1958. Montreal, Canada. 10th International Congress of Genetics. Mr. J. W. Boyes, General Secretary, 10th International Congress of Genetics, McGill University, Montreal, Canada.

August 28-September 1, 1958. Ottawa, Canada. 4th International Biometric Conference, and International Symposium on Biometrical Genetics. Dr. M. J. R. Realy, Secretary, Biometric Society, Rothamsted Experimental Station, Harpenden, Hertfordshire, England.

Sept. 1-6, 1958. Vienna, Austria. 4th International Congress of Biochemistry, International Union of Biochemistry. Professor O. Hoffmann-Ostenhof, I, Chemisches Institut der Universität, Währingerstrasse 42, Vienna IX, Austria.

Sept. 1-13, 1958. Geneva, Switzerland. 2nd International Conference on The Peaceful Uses of Atomic Energy, sponsored by the United Nations. Dr. L. D. P. King, Technical Director, Office for 2nd International Conference on the Peaceful Uses of Atomic Energy, Atomic Energy Commission, Washington 25, D. C.

Sept. 5-13, 1958. Lisbon, Portugal. 6th International Congress of Tropical Medicine and Malaria. Professor Manuel R. Pinto, Secretary-General, Instituto de Medecina Tropical, Lisbon, Portugal.

Sept. 11-19, 1958. Athens and Delphi, Greece. International Union for Conservation of Nature and Natural Resources. International Union for Conservation of Nature and Natural Resources, 31, rue Vautier, Brussels, Belgium.

Sept. 21-28, 1958. Mexico, D. F., Mexico. 11th World's Poultry Science Congress. Mr. E. Karpoff, United States Department of Agriculture, Agricultural Marketing Service, Washington 25, D. C.

Autumn, 1958. Bermuda. Association of Island Marine Laboratories, 2nd Inter-Island Conference. Dr. Juan A. Rivero, Director, Marine Laboratory of the University of Puerto Rico, Mayaguey, Puerto Rico.

Nov. 16-21, 1958. Washington, D. C. International Conference on Scientific Information, sponsored by the American Documentation Institute, National Academy of Sciences-National Research Council, and the National Science Foundation. Mrs. Mary Sheppard, Secretary, Conference Committee, International Conference on Scientific Information, NAS/NRC, 2101 Constitution Avenue, Washington 25, D. C.

Aug. 9-15, 1959. Buenos Aires, Argentina. 21st International Congress of Physiological Sciences. Professor A. O. M. Stoppani, Faculdad de Ciencias Medicas, Paraguay 2155, Buenos Aires, Argentina.

Aug. 19-29, 1959. Montreal, Canada. 9th International Botanical Congress, International Union of Biological Sciences. Dr. C. Frankton, Secretary-General, 9th International Botanical Congress, Science Service Building, Carling Avenue, Ottawa, Ontario, Canada.

Aug. 20-Sept. 8, 1959. Vienna and Salzberg, Austria. 14th International Limnological Congress, International Association of Theoretical and Applied Limnology of the International Union of Biological Sciences. The Secretary, 14th International Limnological Congress, Biologische Station, Lunz am See, Austria.

Aug. 30-Sept. 6, 1959. Barcelona and Madrid, Spain. 9th International Congress on the History of Science. Professor Jean Vernet, Via Layetona 141, Barcelona, Spain.

April 11-16, 1960. New York, New York. 7th International Congress of Anatomy. Professor Louis Flexner, School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania.

Summer, 1960. Madison, Wisconsin, 7th International Congress of Soil Science, International Society of Soil Science. Professor Richard Bradfield, Department of Agronomy, Cornell University, Ithaca, New York.

Autumn, 1960. Paris, France. 10th International Congress for Cell Biology. Professor Chevremont, 20, rue de Pitteurs, Liege, Belgium.

• **James A. Reyniers,** research professor of bacteriology at the University of Notre Dame and founder and former director of the Lobund Institute, will resign January, 1959.

• **J. T. Patterson,** professor emeritus of zoloogy at the University of Texas, has been elected an honorary member of the Genetics Society of Japan.

• **Val W. Woodward,** formerly of Kansas State College, will become professor and chairman of the Department of Biology at the University of Wichita, July 1, 1958. This is a new department, composed of the former departments of zoology, botany and bacteriology. **Alvin Sarachek,** of the Institute of Microbiology, Rutgers University, will also join the biology staff at Wichita University on July 1.

• **Sam C. Smith** has been appointed Associate Director for the Biological Sciences for the Research Corporation, New York. He will be associated with the organization's Brown-Hazen Fund.

• **William G. Lynn,** professor of biology, Catholic University of America, has been appointed Head of the University's Department of Biology. He succeeds the late Edward G. Reinhard, who died earlier this year. Dr. Lynn is a specialist in experimental embryology and endocrinology.

• The Department of Bacteriology at Montana State University now consists of the following staff: Professor **John J. Munoz;** Associate Professor, **Mitsuru Nakamura;** Assistant Professor, **John J. Taylor;** Assistant Professor, **Richard A. Faust;** Assistant Professor, **R. W. Anacker;** and several research assistants.

• **Oscar H. Paris, Jr.,** Department of Zoology, University of California, Berkeley, is the recipient of the General Biological Supply House Scholarship award of $5,000 for the academic year 1958-1959. Mr. Hall will work on a doctoral dissertation in ecology under the direction of Professor Frank A. Pitelka.

• **Ellis Englesberg,** bacteriologist at the Long Island Biological Association, Cold Spring Harbor, New York, has been appointed full professor in the Department of Biological Sciences at the University of Pittsburgh.

• **John Bushnell,** for the past thirty-five years professor of horticulture at Ohio Agricultural Experiment Station, Wooster, has joined the research staff of the Growers' Chemical Corporation, Milan, Ohio.

• **Marcus M. Rhoades,** professor of botany, University of Illinois, Urbana, delivered this year's Jesup Lectures at the Department of Zoology, Columbia University.

• **George W. Corner,** historian for the Rockefeller Institute for Medical Research, has been selected as the recipient of the $5,000 Passano Foundation Award for 1958. The Award will be presented during the convention of the American Medical Association in San Francisco in June. From 1940 until his retirement in 1955, Dr. Corner was Director of the Department of Embryology at the Carnegie Institution.

• **Yost U. Amrein,** Department of Zoology, Pomona College, has been appointed associate professor in the department. Dr. Amrein is at present a research fellow at the National Institute for Medical Research, Mill Hill, London.

• **William G. Van Der Kloot,** associate professor of zoology, Cornell University, will become professor and chairman of the Department of Pharmacology, New York University, College of Medicine, at the close of the academic year.

• **Ralph E. Cleland,** Dean of the Graduate School of Indiana University, has been appointed to the U. S. National Commission for UNESCO. He will represent the National Academy of Sciences-National Research Council.

• **Frank P. McWhorter,** Oregon State College, has been appointed by the FAO of the United Nations to serve as plant virologist to the Philippine Government to investigate coconut diseases. His address beginning April, 1958, will be United Nations Building, Manilla, Philippines.

• **Jacob Furth,** Associate Director of Research of the Childrens Cancer Research Foundation, Boston, has received the Bertner Foundation Award of the University of Texas M. D. Anderson Hospital and Tumor Institute. Furth received the award for his work in radiation biology.

• **Robert B. Brode,** professor of physics, University of California at Berkeley, has been named Associate Director for Research at the National Science Foundation, effective July, 1958. He succeeds **Paul E. Klopsteg** who will continue to serve NSF as a consultant.

• **Theodosius Dobzhansky,** professor of zoology, Columbia University, was the recent recipient of the Kimber Genetics Award of the National Academy of

Sciences as a "versatile and inspired student of the mechanism of heredity, and of the roles which genetic and environmental factors play in the origin and structure of populations and in the process of biological evolution."

• **Jesse P. Greenstein,** Chief of the National Cancer Institutes Laboratory of Biochemistry, has been awarded the 1957 Hillebrand Prize. The plaque and cash award were presented to Dr. Greenstein by the Washington Section of the American Chemical Society.

• **Bernard B. Brodie,** Chief of the Laboratory of Chemical Pharmacology, National Heart Institute, recently received the Distinguished Service Award of the Department of Health, Education, and Welfare. Dr. Brodie was cited for his leadership and original contributions in chemical pharmacology.

• **Andrew J. Ramsey,** professor of histology and embryology, Jefferson Medical College, has been appointed professor of anatomy and head of the Department at Jefferson. He succeeds the late George A. Bennett.

• **Harold E. Anthony,** chairman of the Department of Mammals in the American Museum of Natural History, retired recently after 47 years of service. Dr. Anthony has been appointed Curator Emeritus of the Mammals, effective immediately and, upon his return from a current trip, will become curator of the Frick Laboratory, a research laboratory located at the Museum and maintained by the Childs Frick Foundation for the study of fossil life.

• **Carl F. Schmidt,** professor and chairman of the Department of Pharmacology, University of Pennsylvania, is one of three medical scientists appointed by the International Union of Physiological Sciences to visit South America to discuss problems of medical education and research. The three-man team (C. Heymans, University of Ghent, Belgium, and R. Granit, Karolinska Institute, Stockholm) of the International Union, an affiliate of the World Health Organization, will visit medical schools and facilities in Venezuela, Brazil, Uraguay, Argentina, Chile, Peru, Colombia, Panama and Mexico.

• **Fritz W. Went,** formerly professor of plant physiology at California Institute of Technology, has been appointed director of the Missouri Botanical Garden, St. Louis, and professor of botany at Washington University. Dr. Went will assume his duties September 1, 1958.

• **Paul B. Sears,** director of conservation, Yale University, is Visiting Professor in the Tom Wallace Chair of Conservation in the Biology Department of the University of Louisville during the second semester of 1957-1958.

• **Recent deaths among biologists:**

Merle C. Coulter, Chicago, Ill.; professor of botany and associate dean in the Division of Biological Sciences, University of Chicago. 63; March, 1958.

Henry J. Franklin, Wareham, Mass.; entomologist and founder of the Massachusetts Experimental Cranberry Station in East Wareham, 1908. 75; April, 1958.

Richard B. Goldschmidt, San Francisco, Calif.; professor emeritus of zoology, University of California; geneticist; head of the Kaiser Wilhelm Institute for Biological Research, 1921-36. 80; April, 1958.

Alfred Gundersen, Venice, Florida; curator of plants at the Brooklyn Botanic Garden. 80; February, 1958.

A. E. Holch, Denver, Colorado; professor of botany and chairman of the department at the University of Denver since 1931. 66; March, 1958.

Fred A. Krantz, St. Paul, Minnesota; University of Minnesota since 1919, past president of the Potato Association of America. 67; May, 1958.

Harvey L. Lantz, Ames, Iowa; Horticulturist at Iowa State College since 1917 and professor of horticulture and head of the pomology department of the Agricultural Experiment Station since 1945. 70; April, 1958.

D. T. MacDougal, Carmel, Calif.; director, department of botanical research, Carnegie Institution, 1905-28, and research associate, 1928-34. 93; February, 1958.

Daniel P. Quiring, Cleveland, Ohio; associate professor of biology at Western Reserve University and head of the anatomy department at the Frank E. Bunts Educational Institute. 63; March, 1958.

Richard A. Studhalter, Lubbock, Texas; professor of botany and first head of department of biology, Texas Technological College. 70; March, 1958.

From the Societies

• **The Genetics Society of America** elected the following 1957-1958 officers: President, C. P. Oliver; Vice-President, J. F. Crow; Secretary, H. B. Newcombe; Treasurer, R. D. Owen; Representative to the AIBS Governing Board, Carl P. Swanson.

• The 1958 officers of the **American Genetic Association** are: President, Walter E. Heston; Vice-President, H. J. Muller; Honorary Vice-President, W. E. Castle; Secretary, W. Ralph Singleton; Treasurer, Lawrence G. Burk.

• **The Society of American Foresters,** at a recent annual meeting, elected the following officers for 1958-1959: President, George A. Garratt; Vice-President, Henry J. Malsberger; Executive Secretary, Henry Clepper.

• **The Biological Photographic Association** has the following officers for 1958: President, Leo C. Massopust; Vice-President, Verlin Y. Yamamoto; Secretary, Jane H. Waters; Treasurer, Albert Levin; Editor of Journal, Leo C. Massopust.

• **The American Society of Animal Production,** this year celebrating its fiftieth anniversary, elected the following officers: President, W. M. Beeson; Vice-President, W. P. Garrigus; Secretary-Treasurer, H. H. Stonaker; Editor, W. D. Gallup.

• The 1958 officers for the **Society for the Study of Evolution** are: President, Edwin H. Colbert; Vice-Presidents, Edgar Anderson, W. Frank Blair, T. M. Sonneborn; Secretary, Harlan Lewis; Treasurer, Hampton L. Carson; Editor, Everett C. Olson.

• The 1958 officers of the **American Society of Human Genetics** are: President, William C. Boyd; President-Elect, Madge T. Macklin; Vice-President, Frederick Osborn; Secretary, Eldon J. Gardner; Treasurer, H. W. Kloepfer; Editor, A. G. Steinberg; Representative to AIBS Governing Board, Karl A. Stiles.

• Current officers for the **Society of American Bacteriologists** are: President, Harry Eagle; Vice-President, Philip R. Edwards; Secretary, E. M. Foster; Treasurer, John Hays Bailey.

• 1957-1958 officers for the **Society of Systematic Zoology** are: President, Alfred E. Emerson; President-Elect, Libbie H. Hyman; Secretary, R. E. Blackwelder; Treasurer, Joseph H. Camin.

• The 1957-1958 officers of the **National Pest Control Association** are: President, J. C. Redd; Executive Vice-President, Wayne K. Davis; Secretary-Treasurer, Paul J. McMahon.

• **The South Carolina Academy of Science** recently elected the following officers: President, H. W. Freeman; President-elect, J. C. Aull, Jr.; Vice-President, J. G. Dinwiddie; Councilors, W. E. Anderson, J. C. Loftin, J. D. Reynolds. Through the generosity of the Phipps and Bird Company of Richmond, Virginia, the annual Jefferson Award has been given to **John L. Kice** and **Fred M. Parham** of the University of South Carolina for a meritorious paper presented at the annual meeting of the South Carolina Academy of Science. Research grants have been awarded by the South Carolina Academy of Science to **Thomas R. Scott,** State Hospital, Columbia, South Carolina, and **Gordon R. Thurow,** Newberry College, Newberry, South Carolina. High school student winners of the Science Talent Search in South Carolina for 1958 are **Bostick F. Wyman** of Dreher High School, Columbia, **David W. Bloom** and

Frank Whitesell both of Columbia High School in Columbia.

• **The Northeastern Section of the Botanical Society of America has planned a field foray June 23-25, 1958.** The trip will begin at Pennsylvania State University, University Park; June 23: field trip to Spring Creek and Alan Seeger Monument; June 24: field trip to Alleghany Plateau and to site for inspection and collection of Carboniferous Coral Flora. Return to University Park via the Barrens. Evening: business meeting. June 25: Bear Meadows and return to campus by noon. Registration fee for the foray is $2.50. For further information and housing application write to Dr. A. R. Grove, Department of Botany, Pennsylvania State University, University Park, Pennsylvania.

• **The American Society for Horticultural Science** has made arrangements that members of the Society will be housed together at Indiana University if reservations are made *before* August 9. Single members will be housed in the Men's Quadrangle; families, in Smithwood Hall across from the Education Building. Currently, the ASHS meetings and headquarters will be in the air-conditioned Education Building. The Society is planning a tour August 21-22 through northern and central Indiana to include the following visits: tomato canning plants; a nursery and orchard specializing in dwarf fruit trees; an outstanding orchard which sells a large percentage of its products through roadside stands; Kunnerd's gladiolus farm; Leman and Sons essential oil re-distilling and buying plant; Bernachi & Sons greenhouses and vegetable farm; and the William Gehring farms; growers of mint, potatoes, onions and grain.

On August 23, the Departments of Horticulture and Botany and Plant Pathology will hold open house at Lafayette for those planning to go to Bloomington on the twenty-fourth.

• **The Special Golden Jubilee Anniversary Symposia of the American Phytopathological Society,** to be held during the Bloomington meetings, will contain the following subject sections: 1) Historical and Developmental Aspects of Plant Pathology; 2) The Structure of Viruses (Chairman, W. M. Stanley); 3) The Multiplication of Plant Viruses (Chairman, K. M. Smith); 4) The Chemistry of Fungicides (Chairman, Hubert Martin); 5) Fungicides (Chairman, L. Gordon Utter); 6) The Physiology of Parasitism (Chairman, Robert Schaeffer); 7) Genetic Approach to Elucidation of Mechanisms Governing Pathogenicity and Disease Resistance (Chairman, W. C. Snyder); 8) Soil Microbiology and Root Disease Fungi (Chairman, K. F. Baker); 9) Concepts and Problems of Plant Nematology (Chairman, J. N. Sasser); 10) Epidemiology of Plant Diseases (Chairman, G. W. Keitt).

Education and Manpower

• **The National Science Foundation has announced the organization of 17 additional Summer Institutes for 1958 for high school science and mathematics teachers.** 108 such institutes for the coming summer were announced in December, 1957. A supplementary appropriation of funds by Congress has now made possible the organization of the additional Institutes. Approximately $6,800,000 is being provided through NSF for the operation of the Summer Institutes now scheduled for 1958 and for the support of about 6,400 high school teachers and 250 college teachers who will attend them. The list of the additional Institutes contains the following institutions offering courses in *biology*: 1) University of California, Los Angeles 24, California (Frances E. Blacet); 2) University of Colorado, Boulder, Colorado (Newell A. Younggren); 3) Inter American University of Puerto Rico, San German, Puerto Rico (Ismael Vélez); 4) Northeast Missouri State Teachers College, Kirksville, Missouri (S. Winston Cram); 5) Northwestern State College, Natchitoches, Louisiana (William G. Erwin); 6) Oregon State College, Corvallis, Oregon (Wendell H. Slabaugh); 7) Randolph-Macon Woman's College, Lynchburg, Virginia (Paul A. Walker); 8) South Dakota State College, Brookings, South Dakota (Kenneth E. Howard); 9) University of Texas, Austin, Texas (Robbin C. Anderson); 10) Texas Southern University, Houston 4, Texas (Alberta J. Seaton).

• **Eighty-five in-service teacher-training Institutes, sponsored by the National Science Foundation,** and conducted by U. S. Colleges and universities, will benefit approximately 3,000 high-school teachers of science and mathematics during the academic year 1958-59. Grants totaling $607,250 have been awarded to support the Institutes. Travel expenses, tuition and fees for each participant will be covered by the Foundation grant. Participants in each Institute will be selected from high-school teachers within a radius of some 50 miles of the host institution. Institute meetings will be held outside regularly scheduled school hours, i.e., evenings, Saturdays or late afternoons, so that teachers may attend while still teaching full time in their schools. *Inquiries and applications for participation and questions concerning specific courses offered should be directed to the directors of the individual institutes*, named in the following list. The list that follows contains only those institutions which are offering teaching in the *biological* sciences.

Spring Hill College, Mobile, Ala. (Rev. William J. Rimes, S.J.)
Immaculate Heart College, Los Angeles 27, Calif. (Sister Agnes Ann Green)
San Jose State College, San Jose, Calif. (Prof. Max Kramer)
University of Redlands, Redlands, Calif. (Prof. Robert H. Maybury)
University of Denver, Denver 10, Colo. (Prof. Earl A. Engle)
American University, Washington, D. C. (Prof. Leo Schubert)
Emory University, Emory University, Ga. (Prof. Floyd Jordan)
Kansas State Teachers College, Emporia, Kans. (Prof. Ted Andrews)
Murray State College, Murray, Ky.(Prof. Alfred M. Wolfson)
Western Kentucky State College, Bowling Green, Ky. (Prof. Ward C. Sumpter)
Southern University A & M College, Baton Rouge, La. (Prof. LaFayette Frederick)
Loyola College, Baltimore, Md. (Prof. Charles G. Wilber)
Michigan State University, East Lansing, Mich. (Prof. Frederick B. Dutton)
College of St. Thomas, St. Paul 1, Minn. (Prof. Martin Allen)
William Jewell College, Liberty, Mo. (Prof. Wallace A. Hilton)
Dartmouth College, Hanover, N. H. (Prof. Raymond W. Barratt)
Woman's College of the University of North Carolina (Prof. Hollis J. Rogers)
Antioch College, Yellow Springs, Ohio (Prof. James F. Corwin)
Miami University, Oxford, Ohio (Prof. Walter C. McNelly)
University of Akron, Akron 4, Ohio (Prof. Roger F. Keller, Jr.)
Southeastern State College, Durant, Okla. (Prof. Dorothy V. Leake)
Reed College, Portland, Oregon (Prof. Arthur H. Livermore)
Mt. Mercy College, Pittsburgh 13, Pa. (Prof. William A. Uricchio)
Villanova University, Villanova, Pa. (Rev. J. Bernard Hubbert)
University of Puerto Rico, Mayaguez, P. R. (Prof. Mariano Garcia)
Brown University, Providence 12, R. I. (Prof. Elmer R. Smith)
Incarnate Word College, San Antonio 9, Tex. (Sister Joseph Marie)
Southern Methodist University, Dallas 5, Tex. (Prof. Joe P. Harris)
Hampton Institute, Hampton, Va. (Prof. Frederick D. Inge)
College of Puget Sound, Tacoma, Wash. (Prof. Gordon D. Alcorn)
University of Wisconsin, Madison, Wisc. (Prof. Henry Van Engen)

• **"A Career in Bacteriology,"** publication of the Society of American Bacteriologists, may be obtained by writing to the Society Business Manager, Mr. F. C. Harwood, Mt. Royal and Guilford Avenues, Baltimore 2, Maryland. Requests for 1 to 25 copies will be filled free of charge. Larger orders, usually from institutions, will be filled at the following rates: 25 to 500 copies, 12 cents each; over 500 copies, 10 cents each.

• **The Committee on Educational Policies** of the Division of Biology and Agriculture, National Academy of Sciences-National Research Council, has recently published reports on new approaches to the **teaching of systematic botany and parasitism.** The studies were prepared (with the aid of a National Science Foundation grant) to test an idea for meeting the recurrent problem of keeping teaching abreast of scientific advances (Science, 125:809-810, 1957). One method, the Committee suggested, is to invite an *ad hoc* panel of competent individuals, each expert in a different branch of a given subject, to redefine course objectives and content. This tactic merely adapts the research symposium to consideration of teaching problems, with the hope of encouraging continuing experimentation and reevaluation in teaching by individual instructors.

Members of each panel found, despite wide initial differences of view, that they could develop interesting new syntheses of content, with suggestions for adaptations to different teaching situations. The botanical report (published in *Plant Science Bulletin*, January, 1958) takes a broad view of systematic biology that should also interest zoologists. The parasitism report (published in *Journal of Parasitology*, February, 1958) looks toward a basic course on the biology of parasitism. More generally, the Committee believes that the reports illustrate the value of the approach and recommends that groups concerned with any biological areas consider the organization of similar *ad hoc* panels to help stimulate re-examination of undergraduate courses. Only the individual faculty member, department and college, the Committee emphasizes, can or should decide what to teach, but others in his field may have ideas useful to him.

A limited number of reprints of the two reports are available from the Committee (National Research Council, 2101 Constitution Avenue, N.W., Washington 25, D. C.)

• **"Materials for Teaching Conservation and Resource-Use,"** a publication of the National Association of Biology Teachers, is now available for 35 cents from Interstate Printers and Publishers, Inc., Danville, Ill. A 55-page bulletin, it contains listings of free and inexpensive materials from state and national agencies, selected references, films and film strips, prepared by various members of the Conservation Committee on NABT. The new materials listed in this bulletin were assembled as the appendix of the "Handbook for Teaching Conservation and Resource-Use" reprinted in January by NABT. The Conservation Handbook of 500 pages is also available from Interstate Printers and Publishers for $4.50, with educational discounts to schools and teachers.

• **Vice-President Nixon is scheduled to address a luncheon meeting commemorating the 25th anniversary of the Bausch & Lomb Honorary Science Award in Washington, D. C., on June 17.** The B & L Honorary Science Award is a distinctive bronze medallion that is made available without cost to any high school or preparatory school in the U. S. which offers three science subjects. It is awarded annually by the faculty of each participating school to the graduate who made the greatest progress in science. In the past 25 years, about 125,000 young men and women have received this Award. 36 percent of former winners have chosen science careers. At least 148 scientists listed in "American Men of Science" received the Science Award Medal when they graduated from high school. The luncheon will also honor Dr. Norman H. Nachtrieb who won the first Bausch & Lomb medal 25 years ago and went on to a distinguished career in science. He is now a professor at the University of Chicago. Two young high school graduates who won this year's medals will also participate in the program.

• **The Thomas Alva Edison Foundation has published for public information attractive booklets containing the addresses** made November 21-22, 1957, at Detroit at the Foundation's Eighth Institute on "Science Education and the Talented: New City and State Programs"; the pamphlets are being distributed to educators and civic leaders interested in the problems of science education. Topics are: The Balance Sheet on Education, Rear Admiral H. C. Rickover; The Oklahoma Science Education Story, James G. Harlow and L. M. Spencer; The Indianapolis Science Education Story, Paul E. Johnson and N. G. Sprague; The Detroit Science Education Story, Samuel M. Brownell.

• For the college science departments, high school teachers, or research workers in private industry labs who are asked to "put on a science show," a small booklet, **"Demonstrations in Science,"** prepared by A. P. Burruss of the Texaco Research Center, the Texas Company, Beacon, N. Y., should be of considerable interest. The demonstration program grew out of the desire of the author and his colleagues at the Texaco Research Center to help guide young people interested in the sciences. For each demonstration the objectives are given, and the apparatus and procedures described. Demonstrations include: Paper Chromatography, Bernoulli's Theorem, Cryophorus, Low Temperature Demonstrations, Diffusion-Type Cloud Chamber, Stroboscope, Combustion Phenomena (1) Spontaneous Combustion; (2) Chemical Volcano; (3) Burning of Metals—Zinc Dust; (4) Burning of Metals—Steel Wool, Chemiluminescence—Cold Light, Water-Activated Battery, Static Electricity—Van de Graaff Generator, Fluidized Solids, Dilatancy, Ultra-Violet Phenomena, Foamed Plastic.

• **To celebrate its fiftieth anniversary, St. Albans School, Washington, D. C., held a special program, "Science and Secondary Education".** Speakers were Rear Admiral H. G. Rickover, Dr. Merle A. Tuve and Dr. James R. Killian, Jr. The addresses presented by these men have been incorporated in a small brochure which is available from Russell F. Carpenter, Development Director, St. Albans School, Washington 16, D. C.

A.I.B.S. Reports

• **The AIBS Advisory Committee on Microbiology to the Office of Naval Research** met in Chicago, Ill., April 25-26, 1958. The Committee reviewed the scientific merits of 26 proposals.

• **The AIBS Advisory Committee on Training and Education to AEC** met May 5-7, 1958, at the University of Rochester and reviewed the AEC project at Rochester as well as 46 proposals for equipment grants.

• **An AIBS ad hoc Committee on Whole Body Counters to the AEC** met in Washington, D. C., May 16-17, 1958. The group advised the AEC on the further development of these installations.

• **An AIBS ad hoc Committee on Ecology to AEC** met May 27-29, 1958, at Mercury, Nevada. Certain problems pertaining to the ecology of the AEC Test Site were discussed.

• **The AIBS Advisory Committee on Hydrobiology to the ONR** will meet June 26–27 in Washington, D. C., to advise ONR on certain aspects of its program.

• **AIBS Placement Service.** A proposed revision of the present policy of the Placement Service is under consideration. Instead of the two lists per year currently published, the revision calls for an annual publication, available each spring, for a nominal charge of $1.00. The majority of employers seeking biologists for employment wish to hire for September 1st. Biologists are urged to register at any time during the year, however, as supplemental listings of new applicants will be made available to prospective employers from time to time. Active registrants will receive periodic listings of position vacancies that have been registered with the Service. The facilities of the Placement Service will continue to be offered during the annual AIBS meetings, e.g., this year at Bloomington.

• **Again this year, room facilities will be provided at the annual meetings (Indiana University) for either University or College biology departments that wish to hold reunions** on Sunday evening, August 24. If reservations have been made in time, these reunions will be listed in the General Program. Otherwise,

notices will be posted on the general notice board in the registration area. All such requests should be addressed, as soon as possible, to Mrs. Ann Fraker, American Institute of Biological Sciences, 2000 P St., N.W., Washington 6, D. C.

• **The AIBS Governing Board** met in Madison, Wisconsin, on May 9th and 10th. This was an extraordinary meeting of the Board which was authorized at the regular annual meeting at Stanford. The purpose of the meeting, in general, was to provide an opportunity for the Governing Board members to consider at leisure and away from the distracting influences of the annual meetings of biological societies, long range plans for the Institute. Much discussion revolved around the plans for the Institute in biological education. The major items of the program as outlined elsewhere in this issue were considered and approved by the Board at this meeting. Other specific actions taken were as follows:

1. The Board authorized the revision of the AIBS committee structure concerned with Institute publications. There will be established an editorial board consisting of three or four members for the AIBS BULLETIN and an editorial board of similar size for the volumes published in the AIBS Symposium Series. The Quarterly Review of Biology Advisory Committee will now function with increased responsibility as the editorial board of the Quarterly Review. Each of these boards will report through the Executive Committee to the Governing Board. Along similar lines a committee to supervise all translation programs of the Institute was established.

2. The Governing Board recommended that the Constitution be so revised as to provide for a limited number of members-at-large. These members-at-large would not represent societies.

3. The Governing Board requested the Committee on Education and Professional Recruitment to discuss the matter of accrediting agencies and the procedures they follow and to offer the assistance of the AIBS to these agencies in areas which might be helpful.

4. The application of the Society of Experimental Medicine as an Affiliate Member in the AIBS was approved.

5. The Governing Board reaffirmed the policy that the AIBS offer to extend its convention planning facilities to any interested society in the management of its annual meetings.

Biology Library

One copy of each publication submitted for listing should be sent to the Editor, AIBS Bulletin, Amer. Inst. of Biological Sciences, 2000 P Street, N. W., Washington 6, D. C. Only books published within a year of receipt will be reviewed. Books marked with an ★ are those published by Bulletin advertisers.

ANIMAL SCIENCES

Annual Review of Entomology. Vol. 3. Edited by E. A. STEINHAUS and R. F. SMITH. 520 pgs., illus. Annual Reviews, Inc. in cooperation with The Entomological Society of America. Annual Reviews, Inc., Palo Alto, Calif. (1958) $7.50

The plethora of publications in nearly every scientific discipline weighs on any scientist trying to keep up with the rapidly expanding knowledge in his field. A volume of clear, concise, authoritative up-to-date reviews in timely and important research areas is a breath of spring that melts his "snowed under" condition. *The Annual Review of Entomology* has already established its well deserved reputation for excellent reviews by outstanding specialists.

Volume 3 contains 23 well selected articles reviewing the insect nervous system, chemoreception, internal symbiosis, nutrition of plant eating insects, uses of sound by insects, dynamics of insect populations, ovarian structure, genetics of the honeybee, phylogeny of panorpoid orders, biology of scarab beetles, zoogeography of insects, hybridization and speciation in mosquitoes, feeding habits of biting flies, and transmission of plant viruses. Eight of these reviews concern insect control including the resistance of plants to insects, use of insects for controlling plant pests, chemistry and action of acaricides, organic phosphorus insecticides, insecticides for adult diptera, and control of forage and forest insects. A review on insect eradication programs is especially outstanding.

This 520 page book is a model of editorial accuracy and style. Indispensable in the fields of agriculture and public health as well as in many specialized scientific areas, it will remain an authoritative basic treatise and valuable reference in a rapidly expanding science. *Dale W. Jenkins, Fort Detrick.*

The Invertebrata. L. A. BORRADAILE, F. A. POTTS, L. E. S. EASTHAM, J. T. SAUNDERS. 812 pp. 523 figs., 8 plates. Cambridge University Press, 32 E. 57th St., New York. (1957) $8.50

There is perhaps no other single volume that gives so much information about so many different animals and concomitantly so organizes the information as to bring out its significance. The third edition of Borradaile, Eastham, Potts and Saunders, or 'BEPS' for short brings the book up to date. BEPS was first published in 1932. In 1935 the second edition appeared and was reprinted in 1941, 1946, 1948, 1951, and 1955. The numerous reprintings, and the exhaustion of the 2nd edition stock documents adequately speaks for the acceptance and wide use of this fine text. The main text has been completely revised and the chapter on Insecta completely rewritten in an illuminating fashion. Several other changes have been made and are here noted. The sections on Onychophora, Araneida, Nematoda and Nemertea have been greatly expanded and the graptolita have been transfered from the Coelenterata to the Protochordata. The Endoprocta and Ectoprocta are separated. The first among the acoelomate, the second among the coelomate phyla.

Above all the text figures finally have been made easier to follow by the insertion of labels on the figures instead of a discursive underline. Figures have been further simplified and include well over 100 new inclusions. The section on Molluscs has been beautifully expanded so as to give better insight of the evolutionary changes, patterns and trends.

Of the many changes, which are far too numerous to discuss, one must of necessity be mentioned here. That is the chapter on zoological literature. In this chapter one finds a well ordered annotated bibliography of published papers and current journals. A brief summary of the journals usefulness to the student is included. This helps the student to obtain a preliminary orientation to the zoological literature.

Finally the book has been revised to a point where new facts have been incorporated and documented to illustrate the modern functional approach to biology. I am of the opinion that this bulky volume is a well-rounded and well-documented up to date lucid account of the invertebrata. All of the changes made will keep the book in its leading position for many more years. *R. A. Boolootian, University of California, Los Angeles.*

This year it's Indiana . . .

INDIANA UNIVERSITY, BLOOMINGTON

August 24-28 **August 24-28**

Page 31. Housing information and advanced registration form.

PLANT SCIENCES

Research in Photosynthesis. Edited by H. GAFFRON, A. H. BROWN, C. S. FRENCH, R. LIVINGSTON, E. I. RABINOWICH, B. L. STREHLER, and N. E. TOLBERT. 524 pp. Interscience Publishers, Inc., 250 Fifth Ave., New York 1, N. Y. (1957) $12.00

This book consists of the papers and discussions of the second Gatlinburg (Tennessee) Conference on photosynthesis held October 25-29, 1955. The second conference, like the first, was sponsored by the Committee on Photobiology of the National Academy of Science—National Research Council and supported by the National Science Foundation. The proceedings of the first conference, regrettably, were not published.

Photosynthesis is a broad subject and can be covered only in part during a 5-day meeting. The organizers of the second conference selected as a basic theme the problem of the primary process of photosynthesis together with other reactions which might help in the elucidation of this process. The scope of the conference can perhaps be best illustrated by listing the headings of the major parts of the book: (I) "Absorption, fluorescence, luminescence, and photochemistry of pigments *in vitro*"; (II) "Absorption, scattering, fluorescence, luminescence, and primary photochemical process *in vivo*"; (III) "The possible role of cytochromes"; (IV) "Dark reactions"; (V) "Kinetics, transients and induction phenomena"; and (VI) "Formation and condition of chlorophyll in the living cell".

In a book of this scope it is impossible to single out any particular authors or areas of work for discussion in a brief review of this type. Generally speaking, the contributions are of a very high order, although in many cases they suffer from brevity. This cannot be avoided since there were 67 papers to be published within the limits of a moderate sized book. As a result, the average length of the papers including discussion, is approximately 7.5 pages.

This book represents an exceptionally valuable contribution to the literature of photosynthesis. Even though the conference was held in the latter part of 1955, much material was presented which has still not been published elsewhere. The value of the papers is significantly increased by the transcriptions (sometimes with figures) of the discussions following each paper. In some cases the discussions occupy more space than the corresponding papers. One important aspect is that many details of experiment, lines of argument, etc., are now available in print which might never appear in regular papers.

The first two Gatlinburg Conferences on photosynthesis have been unqualified successes, with the value of the second being much enhanced by the publication of this book. It is hoped that the conferences will be continued and that the results will be made available in this same form. *John D. Spikes, University of Utah.*

How to Know the Seaweeds. E. YALE DAWSON. 197 pgs., illus. Wm. C. Brown Company, Dubuque, Iowa. $2.75

This substantial volume of the "How to Know" series of the same publisher fills a void in the series (the freshwater algae having been treated in an earlier volume) and in the field of useful field manuals for the amateur and student beginning the study of the marine algae. It is to these two groups of persons that the book is especially addressed. Its coverage is ambitious in scope—the Atlantic, Gulf and Pacific shores of the United States. As is customary in the series, the dichotomous key is supplemented with interspersed illustrations to aid the user in understanding the terminology employed. "Algae which are very small, or are of rare or localized occurrence, are omitted", according to the author. The numerous illustrations were prepared by Dr. Dawson from specimens of the algae themselves. In arranging the keys, the several groups of algae (greens, browns and reds) have not been segregated on the basis of color because of the difficulty of deciding this point in some instances. To overcome this disadvantage, a "phylogenetic list of genera and families" (and orders) for each division is presented at the end of the manual. There are included also brief introductory chapters on marine vegetation, methods of collection and preservation, reproduction, references to more extensive works dealing with marine algae and instructions regarding the use of the picture-key. A brief treatment of marine flowering plants follows the key to the algae. A combination index and "pictured-glossary" (for some of the terms) conclude the volume. There is no doubt that this contribution will fulfill the purposes for which it is designed. It will be of value too in stimulating serious interest in these somewhat neglected plants in those who first approach the study of them through this manual. In the light of his expressed intentions, the author has succeeded in producing a book which will be extremely useful to many. *Harold C. Bold, The University of Texas.*

Rye—Climate Relationships and the Use of Phenology in Ascertaining the Thermal and Photo-thermal Requirements of Rye. By M. Y. NUTTONSON. 219 pgs. 87 charts, 17 figs. American Institute of Crop Ecology, 809 Dale Drive, Silver Spring, Maryland. (1957)

Barley—Climate Relationships and the Use of Phenology in Ascertaining the Thermal and Photo-thermal Requirements of Barley. By M. Y. NUTTONSON. 279 pgs. 124 charts, 15 figs. American Institute of Crop Ecology, 809 Dale Drive, Silver Spring, Maryland. (1957)

These two books are the fourth and fifth of a series on the thermal requirements of cereal crops and the nineteenth and twentieth of a series on ecological crop geography written since 1948 by Dr. Nuttonson as research director of the American Institute of Crop Ecology. Both volumes were sponsored by the United States Weather Bureau. A wealth of valuable ecological information on rye and barley is compiled in a form that is most useful to crop ecologists, cereal breeders and agronomists. The information presented and critical analyses made are based on data from many experiment stations of North America and of some thermally analogous areas in the Soviet Union, Finland, Poland and Czechoslovakia. The compilation of heretofore unavailable data from these many sources is a very important contribution to the written record, and represents an enormous task carefully and conservatively executed by Dr. Nuttonson and his staff.

The book on rye-climate relationships presents first a background discussion of the growth habit and climatic requirements of the crop and the general areas of production in the countries from which data are compiled. Subsequently the sowing, heading and ripening dates for several varieties of spring and winter rye in relation to day-degree summations are presented in tabular form and in figures. Finally there is a thoughtful analysis and summary of the significant conclusions to be drawn. The book on barley-climate relationships follows the same general outline, first presenting background material, then data on photo-thermal units and day-degree summations in relation to the phenology of several spring and winter barley varieties grown in the areas considered, and finally an analytical discussion of the materials presented. *Damon Boynton, Cornell University.*

Morphology of Plants. HAROLD C. BOLD. 669 pgs., illus. Harper and Brothers, 49 East 33rd. St., New York, N. Y. (1957) $8.00

It is virtually impossible for a relatively short text on the morphology of the entire plant kingdom to be equally good throughout. If one author writes the text, he at least has the advantage of one style and one opinion to contend with; but he cannot hope to have a completely satisfactory understanding of more than a few of the "Divisions", much less all of them. Thus errors of judgment or choice are almost inevitable. Furthermore, a single author cannot be expected to choose authoritatively one or another of two sides of broad controversies except in those more limited areas where his special competency has qualified him. Thus two opposing lines of evidence in a controversy may be recited as if the arguments for both were equally compelling or equally lacking in cogency. This approach has its merits, of course, but chiefly as a recitation. In spite of these inherent difficulties, the author has done a fine job in arranging the contents of a short book, intended for two semesters, on the morphology of plants.

(Continued on page 32)

A.I.B.S. SPONSORED MEETINGS OF BIOLOGICAL SOCIETIES

INDIANA UNIVERSITY, BLOOMINGTON

August 24-28, 1958

INFORMATION ON HOUSING AND MEALS

RESIDENCE HALLS ACCOMMODATIONS will be available for single persons, couples, and families. Those staying three or four nights will be assigned on the American Plan. Those staying not more than two nights will be assigned on the European Plan, which will also be available for persons participating in the pre- and post-meeting activities.

THE AMERICAN PLAN is a "package" plan of room and meals in an assigned dormitory. Rates are $6.00 per day, $18.00 minimum, for adults; $4.75 per day, $14.25 minimum, for children 7 through 17; $2.85 per day, $8.55 minimum, for children under 7. The American Plan covers the period from dinner on August 24 through luncheon on August 28. Rooms must be vacated by afternoon of August 28. Persons on this plan may occupy their rooms on the night of August 23 at the American Plan rate of $2.25. Persons staying for the night of August 28 or 29 will be moved to the European Plan housing center for these nights.

THE EUROPEAN PLAN is for rooms without meals and will be available for pre- and post-meeting activities and for a maximum of two nights during the regular meetings. Rates are $2.50 per person per night in a room with twin beds, $3.00 for a single room. Meals will be available in the Memorial Union as well as in local restaurants and hotels. Facilities are available for the storage of luggage without cost during the pre- and post-meeting periods.

OTHER HOUSING ACCOMMODATIONS will be available on the campus in the Campus Club (part of the Memorial Union), local hotels and motels, as well as other motels and the hotel and cabins in two state parks within a radius of twenty miles. Rates in the Campus Club are $4.50 for a single room, $5.50 for a room with a double bed, $7.50 for one with twin beds. All rooms are equipped with lavatories and are air-conditioned. Rates in the local hotels and motels compare favorably with those of similar quality in the Middle West generally. Campsites are available in the two state parks which are within twenty miles of the University.

RESERVATIONS for all housing, except campsites in state parks, should be returned as soon as possible on the attached form. *Do not send money with the pre-registration.* Those wishing to share a room with a particular person or to be assigned with a particular group should so indicate on the reservation form.

BANQUETS. The full price of banquets served on the campus will not exceed $3.00. Persons on the American Plan will be given a credit of 50 cents for breakfast or luncheon and 75 cents for dinner for on-campus banquets at the time the banquet tickets are purchased.*

ACKNOWLEDGEMENT of each advance registration *received before August 9* will be made on a form which should be presented on arrival when registration is completed.

PRE-REGISTRATION IS ESSENTIAL TO PROPER ASSIGNMENT OF FACILITIES

REGISTRATION AND HOUSING APPLICATION

Name ..... (First) (Middle) (Surname)

Home Address..... (Street)

..... (City) (State)

Full names, sex, relationship of members, ages of children in my party:

.....

.....

.....

Professional Address .....

.....

Title.....

Institution.....

Society Membership:

(1) .....

(2) .....

(3) .....

I plan to attend the following society banquets.....

.....

I plan to take the following field trips.....

.....

(Applies to Graduate Students only)

Signature of major professor.....

Male ☐ Female ☐ Graduate Student ☐

Expected time of arrival at Indiana University..... (Date & Hour)

By train at Bloomington ☐

By plane at Bloomington ☐

By plane at Indianapolis ☐
(Limousine service available to Bloomington)

By bus at Bloomington ☐

By car ☐

Departure from Bloomington..... (Date & Hour)

Please make reservations for me in a University Resident Hall ☐

I prefer housing in a

Hotel ☐ Campus Club ☐ Motel ☐

I will not require housing ☐

Remarks.....

.....

.....

Please print or type the above information and mail to:

EDUCATIONAL CONFERENCE BUREAU
INDIANA MEMORIAL UNION BLOOMINGTON, INDIANA

Date.....

(Continued from page 30)

The presentation is generally logical and the illustrations ample and often truly excellent, the groups and types of plants are presented in understandable language (though a little strained in passages here and there that the author will wish to change in subsequent editions). Summaries help to bring back on course any who may have become lost in one or a series of chapters, and good questions occur at the end of the chapters. The author has faithfully kept his promise to use whenever possible types that are readily available, and, best of all, tells us how to manage them in an excellent and most useful appendix. It is impossible in a short review to comment adequately either on the author's determination to be "conservative" by increasing the number of "Divisions" in the plant kingdom, or on the reasons given by the author for his point of view.

If the author's generally excellent performance in an extremely difficult task can be taken as properly applauded, a few weaknesses may be pointed out forthrightly. A goodly number of the photomicrographs are inferior and this is not due entirely to difficult material. The most distressing feature of the text to this reviewer refers to use of the illustrations. The reader is repeatedly requested—in both legends and text—to "note" in a figure this or that detail which often is uncommonly difficult to identify, or which is unidentifiable even for one who knows what should be there. This reviewer is convinced that most of the illustrations—especially of the lower plants, but throughout—need many more labels and that these would immensely improve usefulness of the textbook for students and for botanists who are not morphologists. The author may have a different opinion. Although a majority of textbook writers may seem to be convinced that all of paleobotany must be relegated to a separate chapter, it is incomprehensible to this reviewer that the fossil plants should not be considered immediately after their extant allies have been presented. Relatively minor criticisms are such matters as the use of the term sieve tubes for the sieve cells in pine, an almost meaningless description of the discoid pith in *Cordaites*, a misleading sentence concerning a "mechanism for increase in stem diameter" in palms and "certain other genera", and the use of the term "pollen chamber" in at least two connotations without clarifying the situation.

The reviewer closes on another tack; the paper stock and printing are excellent, the book is remarkably free from typographical errors, and, as a final accolade, the author in this fine first edition will undoubtedly succeed in introducing students to the field of morphology in a way that should sharpen their appetites for additional courses in the various fields conventionally grouped under morphology. *Vernon I. Cheadle, University of California, Davis.*

★The Azalea Book. FREDERIC P. LEE. 336 pgs., illus. D. Van Nostrand Company, Inc. Princeton, New Jersey. $8.95

The American Horticultural Society has brought out a successor to the out-of-print, *The Azalea Handbook*. Information from many sources about the history, culture, hybridization, propagation and diseases of evergreen and deciduous azaleas is brought together by the author, aided by a number of other experts. All topics are introduced simply and clearly so that a novice amateur can use the book with great profit and, yet, so comprehensive is the coverage, that long-time azalea fanciers will find facts they have wished they had. Everyone will appreciate the listing of azalea nurserymen and of azalea hybridizers. The excellent black and white illustrations in the chapters on the culture, propagation and diseases of, are large enough to make clear what is intended to be illustrated. The photographs of selected species and hybrids gain enhanced usefulness by having the amount of reduction in size of each photograph given in the legend. Several of the six color plates are of plantings of azaleas that show ways in which attractive plantings can be made. A hardiness guide, by states, and selected cities, and by low temperature and high temperature zones for certain popular species and hybrid groups will save many a buyer from learning at his expense what is already known.

There may not be "everything there is to know about azaleas" in this book, as the publisher enthusiastically says, but the book is undoubtedly better for it. An authoritative selection has made it an indispensable volume for reference and a readable book for useful information. *Harriet Creighton, Wellesley College.*

MISCELLANEOUS

★Fundamentals of Neurology. ERNEST GARDNER. 388 pgs., illus. W. B. Saunders Co., Philadelphia, Pa. (3rd edition, 1958) $5.78

This is an elementary text book on the fundamentals of neurology designed and organized in order to provide the student with a concise basic knowledge of both structure and function of the nervous system. The book develops progressively and systematically from the elementary fundamentals to the more advanced complexities of the subject. It deals not only with basic neuroanatomy, but also with the physiologic processes and the basic relationships between psychology and the higher nerve centers. It includes also a chapter on the biochemistry of the nervous system, a field of ever increasing importance. Facts and implications of clinical importance or diagnostic value are mentioned frequently throughout the book. In this revision the chapters on gross anatomy of the central nervous system, the peripheral nervous system, and the cerebellum have been rewritten, and special attention has been given to sensory endings, vision, and basal ganglia. Some illustrations have been replaced and new illustrations have been added. In most of the twenty chapters are included short biographical sketches of men mentioned in the text or prominent in neurology. *G. W. Casarett, University of Rochester, School of Medicine.*

Mineral Nutrition and the Balance of Life. FRANK A. GILBERT. 350 pgs., illus. University of Oklahoma Press, Norman, Oklahoma. (1957) $5.95

Here is a book every teaching biologist should have to bring himself up to date on mineral nutrition of plants and animals, including humans. A copy should be in high school, college and public libraries where people interested in nutrition can find either all they need to know at the moment, or reference to more extensive reviews, or to the most significant original contributions to our knowledge of the role of minerals in cellular, or whole organism physiology. The bibliography consists of 1177 entries. The selection of good photographs to illustrate the symptoms of mineral nutrient deficiency in crop plants and in domesticated animals is excellent. Included, wisely, are pictures of the symptoms of an excess, to the point of toxicity, of certain of the minerals. The geographic areas where soils are commonly deficient for particular micronutrient elements are mentioned, as are the practices useful for ammending the deficiencies, or for making available to crop plants those which are previously unavailable. The author has used excellent judgment in inclusion and exclusion of the results of research and has cautiously evaluated experimental work so that his summaries are meaningful. The language is technical enough for it to be precise and yet not unreadable and incomprehensible for people who are not trained plant or animal physiologists. Everyone who appreciated Dr. Gilbert's *Mineral Nutrition of Plants and Animals*, plus, it is to be hoped, the many additional users of this more extensive presentation of the relationship of mineral nutrition to the well-being of all kinds of organisms, owes a great debt to him for the time, labor, and judgment which has gone into the publication of this book. *Harriet B. Creighton, Wellesley College.*

Vitamins and Hormones. Advances in Research and Applications. Vol. XV. Edited by R. S. HARRIS, G. F. MARRIAN and K. V. THIMANN. 355 pgs. Academic Press, Inc., 111 Fifth Avenue, New York 3, N. Y. (1957) $9.50

Three of the articles in this volume are on vitamins and related compounds. "The Chemistry of Vitamin B_{12}" is a review of the progress in the period (1954 to 1956) which resulted in the complete structural elucidation of the vitamin. "Total Syntheses of the Carotenoids" provides a basis for labelling with C^{14} any desired carbon atom in the carotenoid molecule, which

should facilitate determination of the physiological action of these compounds. The article on "Carnitine" illustrates the characterization of a substance, in this case a quaternary ammonium compound, as a vitamin (named B_T in 1948)—a growth factor required by the larvae of certain Tenebrionid beetles, but present in almost all other organisms.

Three reviews are devoted to hormones. "Adrenaline and Noradrenaline" is concerned with the formation, fate, actions, assay, distribution and release of these compounds from the adrenal glands and adrenergic nerves. "The Metabolic Effects of Growth Hormone and Their Physiological Significance" is a discussion and evaluation of data that suggest that the direction given to the metabolic sequences which ultimately result in nitrogen retention depends upon the presence of a proper endocrine milieu and favorable metabolic conditions. The peculiar properties and the small samples of blood which must be handled in the assays considered in the "Steroids in Human Blood", further complicate an already complex and difficult situation; however, this article reviews the current status of information in a comparison of the results of studies on healthy and diseased subjects, and includes sections on environmental, experimental and therapeutic influence, and on the fate of administered steroids.

"The Biological Synthesis of Cholesterol" appearing in this volume is relevant to both fields, vitamins and harmones, in consequence of cholesterol's involvement as a precursor of the steroids and vitamin D_3, and as a growth factor for certain protozoa and insects. Finally, another paper concerned with both fields, "A Comparison of the Influence of Hormones, Vitamins and Other Dietary Factors upon the Formation of Bone, Dentine and Enamel"; the formative cells are to varying degrees under the control of vitamin A, C and D and the hypophysis, parathyroids, adrenals and gonads. Differences in characteristic responses to endocrine effects may serve as a key to the fundamental actions of the hormones.

In short, a very wide range of subject matter is reviewed in this most recent volume in the series, *Vitamins and Hormones*. Within the frame of reference set up by the individual reviewers, each of the articles appears to be comprehensive and well-documented. There is much here for the specialist, and perhaps more for the reader with general interests. *Leonard Nelson, University of Chicago.*

Biological Ultrastructure. ARNE ENGSTROM and J. B. FINEAN. 315 pgs., illus. Academic Press Inc., 111 Fifth Avenue, New York 3, New York. (1958) $8.00

The authors state that their aim is to introduce biologists, whether students or research workers, to the field of biological ultrastructure. When writing for botanists, zoologists, medical biochemists, biophysicists, and other people in medicine it is next to impossible to decide what amount of knowledge to presume this array of potential readers will have. The authors are both associated with medical schools and may well have hit the level of mathematical, chemical, physical and biological (zoological) background that medical students and medical research workers have. But this is no introductory treatment for many groups of biologists nor is there enough about the ultrastructure of plant or microbial structures to make the book useful to people interested in them. The chapter "Microscopic Morphology to Molecular Structure" is a brief historical resumé, not extensive enough to be useful to people unfamiliar with the progress made in cytology and rather pointless for up-to-date animal cytologists or cell physiologists. The chapter on "Methods in Ultrastructural Research" briefly discusses the optics of microscopes: light, ultra-violet, phase contrast, interference, dark-field (and micro-incineration), polarizing, x-ray and electron, in 17 pages, so it is no primer. The readers can glean some sense of the limits of usefulness of each type, but only if they are well grounded in microscopy (which unfortunately most biologists are not) will they be able to understand the instruments. For microscopists this part of the chapter provides a brief survey of developments. The approximately 10 pages devoted to preparation of biological material for study with an electron microscope are a good summary of the problems and some of the ways around them, not in sufficient detail to aid the new possessor of an electron microscope, but enough to enable people reading the papers by electron microscopists to have an understanding of the difficulties and limitations of the technique. The same comments hold for the discussion of spectroscopic methods of analysis of biological material. Chapter III is a very quick dash through present thinking on "The Principles of Molecular Structure," so quick that it is useless if the readers do not know it already and contributing little or nothing if they do. Following this are five chapters describing some of the things that have been learned about the proteins, lipids, carbohydrates, nucleic acids with a few words on viruses, nuclei, chromosomes and genes, and mineral salts, all in animal structures. Misleadingly, these chapters are all titled "The Role of—," with the final chapter "The Role of Ultrastructure in Biology and Medicine" in which the point is made that the study of ultrastructure is not an end in itself, but a useful, relatively new, and increasingly important method of obtaining information to aid in the understanding of the growth and functioning of organisms. In addition to references, there are suggestions for further reading at the end of each chapter. College and university teachers, and graduate students will appreciate the bringing together of many items previously scattered in the literature. *Harriet Creighton, Wellesley College.*

Trends in Gerontology. NATHAN W. SHOCK. 214 pgs., 8 figs. Stanford University Press, Stanford, Calif. (1957) $4.50.

This new, highly revised second edition of *Trends in Gerontology* is a brief and highly useful summary of the status of research on the various aspects of gerontology, as well as of some of the population statistics, economic social and cultural forces which make the care and maintenance of the older active and indigent population an increasingly severe public health and political problem. The author deserves commendation for the synthesis he has made of the numerous factors which must be taken into account in finding practical social solutions. The chapter "Research Potentials" is particularly valuable as a brief summary of where gerontological research is being pursued at present and the scientific and medical personnel so engaged.

The book is organized into 10 chapters and a brief introduction (1st chapter). The 2nd chapter deals with the trends in population and demography which have made problems of the aged an ever more pressing social problem. The next six chapters deal respectively with trends in (3) Employment and retirement (4) Income (5) Health (6) Living arrangements (7) Education and (8) Community programs and social work. Chapter 9 outlines and reviews the present status of our knowledge of the aging process while Chapter 10 enumerates the institutions and many of the individuals engaged in aging research on a sociological, medical or fundamental basis. The final chapter sets forth an outline for the establishment of an institute of gerontology with a broad scope of interests and activities including research on: (1) Biology of Aging, (2) Physiology and psychology of aging in man, (3) Medical Aspects of aging in man, (4) Socio-economic aspects of an aging population.

Whereas there is undoubted need for research on all of these aspects of the problem and while research on any of them may aid the understanding of other areas of aging, it is nevertheless the reviewers opinion that the keystone and cornerstone of any real future progress in the social and medical areas is an understanding of the biology of senescence in molecular, biochemical, cellular and physiological terms.

In turn, it would seem likely that the success of the biological approach to senescence will depend primarily on the following:

(1) An upsurge of interest among biologists whether formally concerned with aging research or not in the mechanisms of maintenance and decay of metazoans.

(2) The recruitment of highly talented and skilled individuals to this difficult and as yet poorly outlined area.

(3) The establishment of graduate student courses in the basic biology of aging in Universitities, medical schools or summer biological stations and laboratories.

(4) Continuing long-term support of biological research on aging by both Uni-

versities and the various levels of government.

(5) That the definition of aging research remain sufficiently broad that all varieties of basic biology should be encouraged as parts of gerontology as long as the mechanisms, principles or laws being investigated bear some reasonable relationship to the problems of the stability, development, or decay of biological systems. (Parenthetically, it hardly seems reasonable that, for example, wave mechanics, nuclear physics, systematic taxonomy, and many aspects of oncology or other medical programs of research are sufficiently directly related to the biological aspects of aging that they should either tap the limited funds available or appear as items in lists of publically supported "aging research".)

A quotation from the book sets forth in cogent language, what appears to the reviewer as an excellent guiding philosophy for the expanded interest and research in aging which is now beginning to make itself felt:

"The ultimate goal of action programs in the filed of aging is to minimize the individual and social handicaps of old age as they now exist. . . . Experience has shown that our ability to devise adequate action programs depends on a firm knowledge of the processes involved. The support of basic research on all aspects of aging is therefore essential. . . . Attainment of this goal will require the considered efforts of scientists trained in all disciplines, working individually and collaboratively, as well as the careful thought of individuals who are competent to synthesize and correlate information from many fields." *B. L. Strehler, Baltimore City Hospitals.*

A Classified Bibliography on Gerontology and Geriatrics: Supplement I, 1945. NATHAN W. SHOCK. 525 pgs. Stanford University Press, Stanford, Calif. (1957) $15.00

Not only covering the literature for 1949-1955, but also "filling in" on earlier items not included in the original "Bibliography," published in 1951, this excellent, comprehensive coverage of the literature contains over 18,000 references related to the biological, medical, psychological and socio-economic aspects of aging and old age. Research scientists as well as scholars working in these areas of gerontology and geriatrics will be grateful to the author and the Forest Park Foundation, which financed the publication of the "Supplement," for satisfying a vital need through this volume, by collating the widely scattered (and frequently buried) items of relevance to such fields. The general arrangement of the original "Bibliography" has been followed here with some minor changes which add to the utilitarian value of a publication like this. The use of cross references, where applicable, careful edition, and an excellent format all reflect the author's reputation for thoroughness and painstaking writing. Assisted in the compilation of foreign literature by the outstanding gerontologists of Europe, Great Britain and Japan, Dr. Shock's efforts represent a "must" volume for the general, the science and the medical libraries. *Morris Rockstein, New York University College of Medicine.*

Principles of Biology. W. G. WHALEY, O. P. BRELAND, C. HEIMSCH, A. PHELPS, A. R. SCHRANK with contributions by C. P. Oliver, I. Spear, M. R. Wheeler, O. Wyss. 877 pgs., 421 illus. Harper & Bros., 49 East 33rd St., New York 16, N. Y. (2nd edition, 1958) $6.75

This is a well designed text for courses in which reading assignments are made and in which attention is focused on students who will not major in biology. It tries to give a general picture of things and processes rather than a foundation for more detailed biological work. It is, however, definitely a "biology" text, not merely a union of botany and zoology sections.

With five authors and four other contributors, whose work is not identified, one might expect unevenness in style or quality. This is not evident to the reviewer. Readability seems to be good, illustrations are largely diagrams which are well designed, and organization is logical although spotty because of omission of many subjects. These omissions seem to be due to space limitations, but it is a little surprising to find sections on diffusion and permeability with none on surface phenomena, electrostatic and electrokinetic properties, solution, and equilibria or dynamic steady state.

Although claiming to present "key principles", this book presents almost none as such. It is a good descriptive treatment of general facts and important processes. It has very scanty treatment of systematics, ecology, and development. Surely there are some evidences of evolution more definite than those that are cited as "generally accepted as an indication" or "considered to indicate."

A very useful feature is the placing of the running sub-heads and page numbers at the bottom corner of the page, where they can be most readily thumbed. *R. E. Blackwelder, Victor, N. Y.*

★Chemical Anthropology, A New Approach to Growth in Children. ICIE G. MACY and HARRIET J. KELLY. 149 pgs., 13 figs., 35 tables. University of Chicago Press, Chicago 37, Ill. (1957) $3.75

This small book is essentially an abstract of more extensive growth data on children compiled by one of the authors (Macy). The observations described in the outline were made on eleven children for the 4-6 year group, on an equal number for the 7-9 year group, and on seven of the same children for the 1-12 year group. The material includes measurements of body weight and body size, data on skeletal maturation, on protein, fat and water composition of the total body mass and certain hematological parameters. From these data magnitudes were derived for the extracellular and intracellular water and protoplasmic mass. The uptake and excretion of nitrogen and electrolytes was determined and the retention of nitrogen was calculated from these data.

This information represents a sound contribution to the establishment of baselines which eventually should lead to a better understanding of the relation of metabolic processes and physical growth, although the figures given in the tables can be regarded as useful reference material in the study of growth, the aims of the book of being a "Chemical Anthropology" or a "detailed analysis of the interrelated physical, biochemical and metabolic processes that bear upon the physiologic complexities of human growth" will become fulfilled only in a rather distant future. It also has to be realized that longitudinal studies of child development on a more comprehensive scale have been conducted for some time at several laboratories and therefore to regard the outline presented as "a new approach to growth in children" would seem to require some qualification. *Heinz Hermann, University of Colo. Medical School.*

Cytochemical Methods with Quantitative Aims. Edited by B. LINDSTROM and R. BROWN. 296 pgs. Academic Press, 111 Fifth Ave., New York 3, N. Y. (1957) $9.50

This volume is the report of the 1956 Symposium of the International Society for Cell Biology, held at the Karolinska Institute in Stockholm. The greater part of the volume is devoted to biophysical methods, but there is also a small part dealing with the biochemical approach. The first section, on optical absorption methods, is principally concerned with the formidable microspectrographic instrumentation that exists at the Karolinska Institute. Technical considerations predominate in this part; it is unfortunate that the one biological paper in the section reveals an impressive technical virtuosity lavished on a singularly naive problem. Other papers in this area include a valuable study of the stiochiometry of the Feulgen stain applied to sperm heads, by Walker and Richards; and a useful one, by Sandritter, Pillat and Theiss, on the action of ribonuclease as applied to liver cells prepared for microspectrographic study. The second section is made up of five articles on interference microscopy. Providing a nice balance between theory and application, these papers constitute a brief textbook that will be of great value to any serious student of this interesting new technique for measuring dry mass. The third section, on the quantitation of x-ray absorption methods applied to tissue sections, is largely restricted to potentialities, since this technique is very much in its early developmental stages. Following is a short series of papers on the quantitation of the more familiar technique of autoradi-

ography. Of special value here is H. Levi's critical examination of the methods that have been used for measuring numbers of labelled atoms. In the final part, on biochemical methods, the most noteworthy paper is a concise, detailed account, by E. Robins, of fine-scale quantitative methods for enzymes and other substances. The rest of the section is largely devoted to nucleic acids, and contains an intriguing study, by Løvtrup and Roos, on the microbiological determination of DNA. The whole volume, although too technical for casual reading, will be useful to those who need to keep abreast of technical advances, and will repay serious study by those interested in the application of some of these techniques to their own problems. *Florence Moog, Washington University.*

★The Foundations of Life Science. MARK GRAUBARD. 627 pgs., illus. D. Van Nostrand Co., 120 Alexander Street, Princeton, N. J. (1958) $6.50

This book has been prepared for the final unit of a one year general science course giving a "panoramic view of the intellectually stimulating fundamentals of science." It offers a comprehensive selection of the basic concepts of the life sciences, all very clearly presented. The result suggests that the better books written for such general purposes will also prove to be the better books for introductory courses which must serve both non-major and prospective major students. When the needs of prospective majors loom before us our curriculum tends to suffer a little as the concern for detail distracts us from the substantive broad issues of our field.

Obviously in a basic text an author must select some topics for emphasis, omit or slight others, and engage in some gross simplifications. In so doing he will never satisfy everyone. Greatest disagreement may focus on the absence of even a cursory review of the animal and plant kingdoms. On the other hand most will wholeheartedly endorse the treatment of life processes as all-biological, not differentiated by kingdoms though often best illustrated by selected life forms. For an introductory text most would also agree with the frequent references to vertebrates, particularly to the human, when suited for illustrating biological principles. The ecology-minded may justly complain of a lack which is by no means peculiar to this text. Whereas life is portrayed in terms of its "building blocks" and functional processes, the author does not emphasize that life is an expression of energy in a total energy system. Such an emphasis would seem essential in a foundations course and would provide an opportunity to pull together a general science curriculum involving physical and biological processes.

This is certainly a solid, reasonably comprehensive, up-to-date text for the introductory college level. Noteworthy characteristics helpful in teaching and study are the wealth of good illustrations, the chapter study questions, and the chapter bibliographies. *Nelson Marshall, Alfred University, Alfred, New York.*

Chronic Radiation Hazards: An Experimental Study with Fast Neutrons. G. J. NEARY, R. J. MUNSON and R. H. MOLE. 191 pgs., 45 figs. Pergamon Press, 122 East 55th St., New York 22, N. Y. (1957) $7.50

This monograph is essentially a detailed description of a large-scale, long-term (six years) study of the biological effects of chronic irradiation of mice with fast neutrons performed at the United Kingdom Atomic Energy Research Establishment at Harwell. The coverage includes experimental design, dosimetry, effects of the neutron irradiation, and discussion of relative biological efficiency of fast neutrons and gamma rays in chronic exposure. The subject matter is well-organized, lucidly presented, and extensively detailed; the data are handled adequately and the interpretations are reasonable.

This book will be invaluable to research workers who have any interest in studies of neutron irradiation and useful to those generally interested in the effects of radiation on biological systems. For other categories of readers, the treatment is too specialized.

The question may well be raised as to how the details of large scale experiments can best be made available. It would hardly seem that publication in book form at commercial prices is the answer. *C. L. Comar, Cornell University.*

A Manual of Paper Chromatography and Paper Electrophoresis. RICHARD J. BLOCK, EMMETT L. DURRUM, and GUNTER ZWEIG. 710 pgs., illus. Academic Press Inc., New York, N. Y. (2nd edition, 1958) $12.80

This book is intended to enable the reader to practice the art of paper chromatography (Part I) and paper electrophoresis (Part II) for his own purposes without extensive study of other works. It not only accomplishes this purpose but also gives a discussion of the principles upon which the art is based. The description of equipment ranges from the simple devices that can be set up at once by anyone to the expensively finished cabinets that now decorate so many laboratories. The discussion of diversified methods gives the pleasant impression that the authors themselves have had extensive experience with a wide variety of methods and of applications. Unfortunately, centrifugal chromatography, that promises to speed up the process enough to remove a major barrier to the use of chromatography as an auxiliary method in studies based primarily on other procedures, has developed so recently that only a single paragraph on the subject is included.

After discussing theory, equipment and both qualitative and quantitative detection procedures, Part I goes on to give detailed instructions for the analysis of the following classes of substances: amino acids and peptides, amines, carbohydrates, aliphatic acids, steroids, bile acids, purines, pyridines, phenols, aromatic acids, natural pigments, antibiotics, vitamins, inorganic substances and miscellaneous organics. For most of these categories the manual provides enough detail to take the reader directly to the laboratory. Plant biochemists will, however, feel that their pigments have been unduly slighted, since this field is covered only by a few references while detailed procedures are given for separating many other classes of substances. The use of paper chromatography for protein separation is also treated very briefly although Part II deals almost entirely with protein electrophoresis on paper.

Part II starts with general theory followed by methods, continuous electrophoresis, quantitative considerations and an appendix of suitable buffer solutions. There are no separate chapters for particular groups of compounds in this part dealing with paper electrophoresis but rather a seven-page subject classification of the bibliography. The book has comprehensive bibliographies for each part, an index to R_f values and a subject but not an author index.

Two quotations show different aspects of the kind of a book that this is:

"Filter paper will enjoy its reign of popularity only until a better supporting material is found. When a more uniform material with less adsorptive capacity is developed, the concepts of countercurrent distribution and fractional distillation will undoubtedly be more closely allied with those of partition chromatography."

"At the present writing more than two thousand papers dealing with the subject of zone electrophoresis have appeared. Over 90% of these have dealt with paper electrophoresis. A bewildering array of equipment, varying principally in minor details, confronts the inexperienced worker. Fortunately, all these types of apparatus fall into three basic categories. An understanding of the principal differences in these types is fundamental to the intelligent choice of equipment for any given practical problem. It is the purpose of this section of this book to acquaint the average laboratory worker with the different basic types of equipment available, to instruct him in their use, and to guide him in their appropriate application."

Few people will look at this book without trying to find a way to solve some of their own problems on paper. *C. S. French, Carnegie Institution of Washington, Stanford, Calif.*

An Introduction to Genetic Statistics. OSCAR KEMPTHORNE. 545 pgs., illus. John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y. (1957)

The foundations upon which the structure of statistical genetics has been built were laid largely by Sewall Wright in this

country and R. A. Fisher in England, with additional contributions by J. B. S. Haldane. Several volumes inspired by the work of Wright have already appeared (such as those by J. L. Lush and C. C. Li). The present book was clearly inspired by Fisher's contributions, and represents the first comprehensive treatment of its sort. It includes, in addition, accounts of the original contributions of the author and his collaborators.

It is customary to divide the field of statistical genetics into two areas, that concerned with the study of quantitative genetics and that concerned with population genetics: the book by Lush treats with the first area, while that of Li deals with the second. Kempthorne thoroughly reviews both areas. The first ten chapters of the book deal with population genetics. They include discussion of the genetics of panmictic populations, selection, inbreeding, stochastic theory, and some special problems of human genetics. The remaining thirteen chapters are devoted to the analysis of quantitative inheritance. This includes the analysis of sources of quantitative variability by partition, multiple regression, correlation, and path coefficients. The inheritance of quantitative traits in random mating and non-random mating diploid and polyploid populations is outlined, as are the effects of epistacy, inbreeding, and selection. The inclusion of chapters devoted to probability theory and statistical methods *per se* makes the book practically self-containing.

While inspiration for the book is attributable to R. A. Fisher, the work of Wright is reviewed. The book therefore represents a first step toward the synthesis of the contributions of these two highly original and independent workers. The merits of this approach, and of the all-inclusive plan of the book, are marred however by the cavalier attitude displayed toward some of Wright's methods. Malecot's treatment of inbreeding, for example, is preferred to that of Wright because it "lays bare the crucial ideas untrammeled by unnecessary assumptions." The powerful method of path coefficients is presented only in outline because it is judged to be "somewhat confusing." Wright's contributions to the stochastic theory of genetic populations are said to "have been based on the Fokker-Planck equation," whereas in fact he derived this equation independently as the differential equation of the distribution of gene frequencies in populations.

These remarks should not detract, however, from the general merits of the book. Kempthorne may be overly optimistic when he suggests that "the prerequisites for the book are essentially nil if we assume that all readers will have had high school algebra," but his work should be of great value to graduate students and specialists in the field. It is a scholarly work of first rank. *Allen S. Fox, Michigan State University, East Lansing.*

This year it's Indiana . . .

INDIANA UNIVERSITY, BLOOMINGTON

August 24-28 **August 24-28**

Selected RONALD *Books*

BIOGEOGRAPHY

An Ecological Perspective

Pierre Dansereau, *University of Montreal*

A valuable synthesis of the environmental relationships of living organisms, with emphasis on the higher plants. Using materials drawn from the author's field work in 16 countries, ranging from Baffin Island to the Philippines, this book analyzes the components of biogeographic community in terms of their historical setting, climatic tolerance, adjustment to habitat and to one another, and their genetic make-up. The major aspects of man's transformation of the landscape are also considered. Both the American and European schools of biogeographical thinking are quoted and evaluated. *183 ills., tables; 394 pp.* $7.50

Principles of PLANT PATHOLOGY

Elvin C. Stakman, *Emeritus, University of Minnesota;*
J. George Harrar, *The Rockefeller Foundation*

This practical book explains the broad interrelationships between plants as economic resources and the diseases which limit their productivity. It deals with specific diseases and stresses those which are epidemic in character, causing the greatest economic loss. Emphasizing food crops, book gives details on disease control in transit, storage, and in the field. An authoritative textbook for students and an invaluable reference for scientists and specialists concerned with increasing the world's food production. *165 ills., tables; 581 pp.* $8

BIOLOGY and CONTROL of the SMUT FUNGI

George William Fischer, *State College of Washington;*
Charles Stewart Holton, *U. S. Dept. of Agriculture*

A comprehensive analysis, on a world-wide basis, of our knowledge of the smut fungi. Book discusses the historical aspects of the smut fungi and their phylogeny, morphology, and taxonomy. It describes the various techniques for research on the smuts; the effect of smuts on man, animals, and cultivated crops; and the control measures used to combat the diseases they cause. A unique feature is a host family register of more than 1,100 species of 33 genera, with the species catalogued by host family. *117 ills., tables; 622 pp.* $10

MANUAL of the NORTH AMERICAN SMUT FUNGI

Also by **Fischer.** A taxonomic treatment of North American smut fungi. Includes 22 genera, 276 species, and varieties on species of 242 host genera. *136 ills.; 343 pp.* $8.75

The SMUT FUNGI

Also by **Fischer.** A guide to the literature of smut fungi contained in more than 3,000 scientific papers, bulletins, and books in many languages. *387 pp.* $8.50

Order your books from:

THE RONALD PRESS COMPANY • 15 E. 26th St., New York 10

Announcing . . .

two additional Russian translations.

SOIL SCIENCE (POCHVOVEDENIE)

This Russian journal appears 12 times a year; approximately 1,600 pages per year.

Annual subscription prices: $40.00 (Individuals, industrial libraries)
$20.00 (Academic and non-profit libraries)
$ 3.00 extra on each price for foreign subscriptions.

ORIGIN OF THE ANGIOSPERMS. *by* A. K. TAKHTADJIAN.

Edited by G. LEDYARD STEBBINS. *Translated by* OLGA H. GANKIN. Approx. 70 pgs. Available immediately. Price $3.00 per copy. $3.50 foreign.

Have you ordered??

(1) **Doklady. Biological Sciences Section.** 6 issues per year. $20.00 per year U. S. & Can. $22.50 per year foreign.

(2) **Doklady. Botanical Sciences Section.** 6 issues per year. $7.50 per year U. S. & Can. $9.00 per year foreign.

(3) **Microbiology.** 6 issues per year.
$20.00 per year U. S. & Can. $22.50 per year foreign.

(4) **Plant Physiology.** 6 issues per year.
$15.00 per year U. S. & Can. $17.00 per year foreign.

All orders should be placed with:

AMERICAN INSTITUTE OF BIOLOGICAL SCIENCES

2000 P Street, N.W. Washington 6, D. C.

Laboratory Manuals . . . for your classroom needs

for College Botany Courses

- **STRUCTURE AND FUNCTIONS OF THE FLOWERING PLANT**
  by Robert W. Hoshaw, Sanford S. Tepfer and Raymond M. Turner
- **SURVEY AND USES OF THE PLANT KINGDOM**
  by Robert W. Hoshaw and Robert M. Harris

These laboratory manuals help you teach students to understand and appreciate the plant kingdom by first-hand contact in the laboratory. Each manual includes exercises on 14 topics. Price $2.50 each.

Two Books for Biology Courses

by Otto E. Kugler and John F. Glawe, University of Illinois

- **A GENERAL BIOLOGY MANUAL, PART I**

Designed for a one-semester course in general biology. Deals with plants and animals as individuals, their principles of structure, functions and development. Price $2.50.

- **A GENERAL BIOLOGY MANUAL, PART II**

Intended for use by students who continue for an additional semester. Deals with principles of classification, evolution, genetics and ecology which apply to the interrelationships of organisms. Price $2.75.

Order now . . . to consider these books for fall requirements

BURGESS PUBLISHING CO. 426 So. 6th St. • Minneapolis 15, Minn.

LIVER FUNCTION

Edited by RALPH W. BRAUER

Liver Function is the fourth publication in the AIBS Symposia Proceedings Series. The Symposium was held in San Francisco, October 30–November 2, 1956, jointly sponsored by the Atomic Energy Commission, the Office of Naval Research, the Bureau of Ships and the Bureau of Medicine and Surgery, U. S. Navy Department, in collaboration with the American Institute of Biological Sciences. All papers presented during the symposium and the discussions that followed are included in the publication. Thirteen additional papers, highly pertinent to the subject, have also been added.

The Cell Population of Liver Tissue and the Cytological Reference Bases, *R. Daoust;* Classification of Liver Cell Nuclei by Size and Feulgen Reaction, *M. Alfert;* On Chromosomes of Rat Liver Cells, *R. Kinosita;* Chemical Reference Substances, *H. W. Kosterlitz;* Liver in Relation to Body as a Whole, *A. R. Behnke, Jr.;* Some Aspects of the Function of Connective Tissue Elements of Liver, *R. D. Harkness;* The Measurement of Liver Blood Flow, A Comparison of the Parameters Measured, *E. L. Dobson;* The Role of the Liver Blood Flow in the Homeostatic Regulation of Body Fluid, *E. L. Dobson;* Indicator Dilution Methods in the Measurement of the Splanchnic Blood Flow of Normal Dogs, *L. A. Sapirstein;* The Application of Internal Calorimetry to the Measurement of Liver Blood Flow Responses, *J. Grayson;* Flow Distribution in the Liver and the Circulatory Control of Liver Function, *R. W. Brauer;* Functional Differences between Hepatic Artery and Portal Venous Regions, *W. H. H. Andrews;* Sinusoids and Sinusoidal Flow, *B. G. Maegraith;* Intrahepatic Circulation in Mice, *K. Nakata;* Osmotic Pressue of Liver Cells, *E. L. Opie;* "Watery Vocuolation" and "Hydropic Degeneration" of the Liver Cell, *K. Aterman;* Hepatic Structure in Relation to Function, *J. W. Wilson;* A Study of the Spatial Relations between Endoplasmic Reticulum and Mitochondria in Liver Cells, *M. G. Piccardo;* Quantitative Aspects of Phagocytosis, *B. Benacerraf;* Bile Duct Cells and Their Blood Supply, *B. G. Maegraith;* Bile Duct Cells and Bile Secretion, *W. H. H. Andrews;* The Architectural Organization of the Liver in Relation to the Reference Base for Liver Function, *A. M. Rappaport;* Bile Ductular Reaction, *H. Popper;* Endothelia and Permeability, *D. Gitlin;* Chromaffin, Granulated Cells in Liver Biopsy. A Preliminary Report, *J. Adams-Ray* and *H. Nordenstam;* Dye Secretion and Dye Uptake by the Liver, *V. Hanzon;* Bile Pigments in Blood, Lymph and Bile in the Course of Experimental Bile Stasis, *J. L. Bollman;* The Effect of Benemid on the Hepatic Extraction and Biliary Excretion of Bromsulphalein, *S. L. Stone;* The Metabolism of BSP and its Effect on the Plasma Clearance of BSP, *J. S. Krebs;* Bile Acid Formation and Excretion, *S. Bergstrom;* Plasma Protein Control by the Liver, *S. C. Madden* and *L. J. Zeidis;* The Preparation of Labeled Plasma Protein, *H. Tarver* and *S. Margen;* Regulation of Plasma Cholesterol, *S. O. Byers;* Possible Relations of Liver Phosphatide Metabolism of Various Species and Their Susceptibility to Experimental Atherosclerosis, *D. B. Zilversmit;* Certain Aspects of the Relations between Nutrition and Liver Function, *F. S. Daft;* Effect of Cyclic Feeding of High and Low Protein Diets on Fatty Infiltration and Fibrosis in Rat Livers, *W. S. Hartroft;* Liver Function and Circulatory Changes Especially in Relation to Intra-abdominal Pressure, *S. Olerud;* Findings of Experimental Work with Regard to the "Spleen-Liver Mechanism", *J. Schmier;* Comparative Studies of Liver Function in Dogs with Eck Fistula or Portacaval Transposition, *W. Silen, H. A. Harper, R. G. DeReimer,* and *H. J. McCorkel;* Liver and Sex Hormones, *G. R. Biskind;* The Effect of Stress and ACTH on the Metabolism of Hydrocortisone, *T. F. Dougherty* and *D. L. Berliner;* Influence of Cortisone and Prednisolone in Hyperbilirubinemia, *R. Katz, H. Ducci* and *H. Alessandri;* Liver Regeneration and Liver Function, *A. D. Glinos;* Toxic Lover Injury, *V. A. Drill;* A Possible Biochemical Lesion in the Liver Attributable to Alcohol, *K. S. Henley, H. S. Wiggins, H. M. Pollard,* and *B. I. Hirschowitz;* Sulfur Amino Acid Metabolism in Liver Necrosis following Bromobenzene Administration, *W. E. Cornatzer* and *F. Snyder;* Mitochondrial Function and Toxic Liver Injury, *J. D. Judah* and *K. R. Rees;* Amino Acid Metabolism in the Eck Fistula Dog, *J. L. Bollman;* The Effect of Arginine on the Blood Ammonia, *H. A. Harper, J. S. Najarian,* and *J. Q. Owsley;* The Effect of a Large Portal-Systemic Collateral Circulation in Man, *S. Sherlock;* Dietary Necrotic Liver Degeneration—An Approach to the Concept of the Biocehmical Lesion, *K. Schwarz;* The Electron Microscopy of Dietary Necrotic Liver Degeneration, *M. G. Piccardo* and *K. Schwarz;* A Note on the Glucose Tolerance Factor (GTF), a New Dietary Agent, *K. Schwarz* and *W. Mertz;* Dihydroxyacetone Tolerance Test as an Aid for the Diagnosis of Glycogen Storage Disease, *G. M. Guest* and *W. Cochrane;* A Note on the Study of Some Enzymes in the Human Liver in Kwaschiorkor and in Marasmus, *J. C. Waterlow;* Congenital Defects in Bilirubin Metabolism, *R. Schmid;* "Direct" Bilirubin Production in Rat Tissue Homogenates, *G. M. Grodsky* and *J. V. Carbone;* Physiology of Liver Cirrhosis, *C. S. Davidson;* Liver Damage in Parasitic Disease, *B. G. Maegraith;* Factors Affecting Water and Sodium Retention in Patients with Liver Disease, *E. P. Ralli, E. Orti, M. E. Dumm, S. H. Leslie* and *B. Laken;* The Liver in Traumatic Shock, *J. Fine;* The Liver in Thermal Burn Injury, *G. F. Warner;* The Effect of Hemorrhage on the Splanchnic Blood Flow, *L. A. Sapirstein;* The Application of Internal Calorimetry to the Study of Liver Blood Flow Response during Hemorrhage, *J. Grayson;* Liver Cell Mass, Liver Cell Capability, and Liver Cell Environment in Relation to Liver Performance, *J. G. Reinhold;* Prognostication and Liver Function Tests—Clinical and Chemical Consideration, *D. Seligson;* The Apparent Meaning of Liver Function Tests, *L. Zieve.*

Ready July 1958

$8.95 ($7.95 to AIBS Members)

Orders and inquiries should be addressed to:

AMERICAN INSTITUTE OF BIOLOGICAL SCIENCES

2000 P Street, N.W. Washington 6, D. C.

RUSSIAN BIOLOGY RESEARCH

In Complete English Translation

Also { A German-English Neurophysiology Glossary
A Russian-English Hydrobiology Glossary

SOVIET PHARMACEUTICAL RESEARCH—Chemistry Collection No. 4

Covers all aspects of Soviet pharmaceutical research; papers selected by one of the top pharmaceutical research chemists, of one of the major drug companies, from all Russian chemistry journals translated by Consultants Bureau, 1949-1955.

I. PHARMACEUTICAL CHEMISTRY. Sections: Solubility; Stability; Ion Exchange; Emulsions, Suspensions, Gels; Miscellaneous. 74 papers, 447 pages, $95.00

II. PHARMACOGNOSY. Sections: Alkaloids; Oils; Glycosides; Miscellaneous. 87 papers, 399 pages, $90.00

III. MEDICINAL CHEMISTRY. Sections: Structure-Activity Relationships; General. 91 papers, 556 pages, $100.00

THE COMPLETE COLLECTION, 252 papers, 1,402 pages, only $200.00

*Single articles available—Table of Contents sent on request—Address Dept. AB

GERMAN-ENGLISH NEUROPHYSIOLOGY GLOSSARY, compiled, and with a preface, by Roger M. Morrell, M.D. Makes the voluminous, highly significant, and largely untranslated German literature in this increasingly important field, more accessible to English reading scientists. Contains expressions in neuroanatomy, biochemistry, physiology, neurology, electrical engineering, and electronics, as well as idioms and selected general vocabulary. 9,000 German terms, 181 pages, $7.50

RUSSIAN-ENGLISH HYDROBIOLOGY GLOSSARY. The first and only one of its kind. Contains all terms in the 1955 edition of the N. N. Smirnov Hydrobiology Glossary, published under the auspices of the Ministry of Culture, USSR. Meets the need for a Russian-English translation tool in this important field, in which the Russian contribution is rapidly growing in volume and achievement. Contains expressions in anatomy, biology, botany, hydrobiology, zoology, medicine, morphology, physiology, entomology, ornithology, hydrology, ichthyology. 6,000 Russian terms, 85 pages, $7.50

All Consultants Bureau's translations by bilingual *scientists*, equally familiar with Russian and the technical terminology. All diagrammatic and tabular material integral with the text is included; text is clearly reproduced by multilith process from IBM cold type; books are staple bound in durable paper covers. Complete catalogs of Consultants Bureau translations available—address Dept. AB.

CONSULTANTS BUREAU, INC.

227 West 17th Street, New York 11, N. Y.

BOOKS by Prentice-Hall . . .

THE MICROBIAL WORLD

by R. Y. STANIER, MICHAEL DOUDOROFF and EDWARD A. ADELBERG, all of the University of California

Aware of the need for a general Microbiology text that would be understandable to the beginner without sacrificing accuracy of information, the authors have pooled their knowledge and teaching experience to provide a unique account of the microbial world based on general biological principles. It includes a highly original appendix designed to serve as an introduction or as a review of the principles of cellular biology needed for understanding the material in the text. Wealth of line drawings, original illustrations, charts, tables, footnotes, and extensive bibliographies.

682 pages ***Published April 1957***

Text price $8.00

CYTOLOGY AND CYTOGENETICS

by C. P. SWANSON, Johns Hopkins University

Here at last is a unified account of the advances made in cytology and cytogenetics. Information derived from recent studies vastly contributes to a clear understanding of the structure and behavior of cells — both as units of organic heredity and as evolutionary potential. This work emphasizes modern experimental approaches that deal with the mechanisms and the interrelations of form and function. Unusually comprehensive, the text thoroughly covers — viruses, bacteria, and fungi in addition to the higher life forms.

596 pages ***Published 1957***

Text price $10.00

To receive approval copies promptly, write Box 903

PRENTICE-HALL, Inc.
Englewood Cliffs, New Jersey

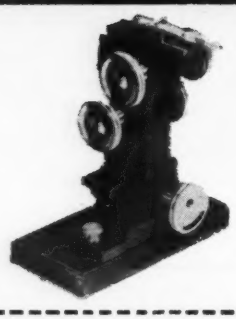
Brinkmann U.S.A.

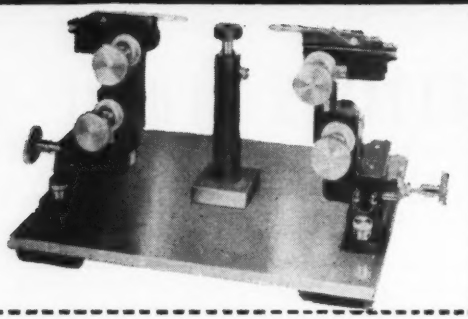
The most complete line of truly precision-built

MICRO MANIPULATORS

for scientific and industrial operations.

Brinkmann Micro Manipulators are available for use with stereoscopic and compound microscopes at magnifications from 10 to 1000 x. They can be used singly or paired. Many accessory items such as automatic pipette pullers, micro injection devices, pipette holders and microvises are available.



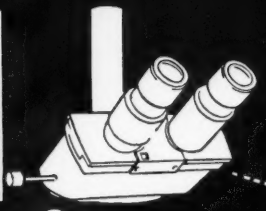


BRINKMANN INSTRUMENTS, Inc.
Brinkmann House
Cutter Mill Rd.
Great Neck, L. I., N. Y.
3214 North Broad Street
Philadelphia, Pa.

THE MOST VERSATILE PHASE MICROSCOPE EVER MADE

Phasestar's building block concept of design, exclusive with AO Spencer, offers you a choice of more than 50 different models.

Low cost 35 mm. camera for crisp, inexpensive photomicrography. Coupled system lets you shoot what you see.

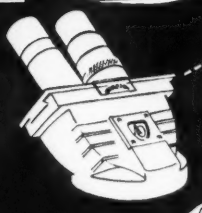


Choice of 3 interchangeable full 360° rotatable bodies, monocular, binocular, and trinocular, inclined for comfort. Special inclined monocular and vertical monocular bodies for photomicrography available.

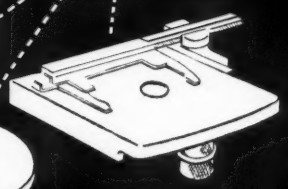
No other Phase Microscope can offer you such a wide choice of interchangeable parts and accessories.

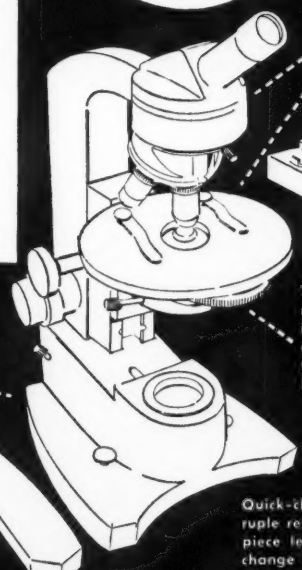
You can adapt the Phasestar to your exact needs with various combinations of readily interchangeable bodies, stages, bases and optics. You have more than 50 possible combinations or models to choose from.

Your Phasestar will be "just right" for you in convenience, comfort and the economy of real quality.



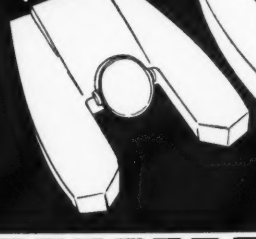
Focus stage and specimen to the objectives with low-positioned coarse and fine adjustments. Choose from 3 interchangeable stages, graduated or ungraduated mechanical stages or the new Micro-Glide circular stage.





Your choice of interchangeable horseshoe base with double-plano mirror in fork mount or built-in base illuminator.

The large fork type condenser mount allows you to quickly interchange a wide selection of Phase condensers . . . turret type, single unit or special long focus.

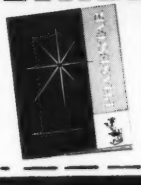


Quick-change quadruple revolving nosepiece lets you interchange complete sets of phase, achromatic and apochromatic objectives quickly and precisely.

American Optical Company

INSTRUMENT DIVISION, BUFFALO 15, NEW YORK

SPENCER



● Dept. F197

Please send me the new Phasestar brochure

Name.....

Address.....

City .....Zone.....State.....

AGRICULTURE LIBRARY
UNIV. OF MINNESOTA
ST. PAUL 1, MINN.

Laboratory: 4 acres square, 12 inches deep

Last year, this was just another tobacco patch. *This* year, it's a carefully cultivated, closely watched field laboratory for experimental strains of tobacco.

The new strains are developed (many each year) in Federal and State Agricultural Experiment Stations. The crops are grown on typical farms—under the scrutiny of both government and American Tobacco Company scientists. And both groups take tobacco samples for study.

At American Tobacco's Research Laboratory in Richmond, the test crops are analyzed and compared with standard varieties. Results are sent to the government scientists who first developed the strains. If a strain proves successful, complete information is disseminated by the government throughout tobacco land.

Similar programs have been carried on since 1947, when American Tobacco became the first company to cooperate with the government for tobacco research. Our own research activities started back in 1911. They're part of our policy to learn all there is to know about tobacco—and then put that knowledge to good use.

The American Tobacco Company

FIRST IN CIGARETTE RESEARCH

LUCKY STRIKE • PALL MALL • HIT PARADE • HERBERT TAREYTON • FILTER TIP TAREYTON